United States Court of Appeals

for the

District of Columbia Circuit

TRANSCRIPT OF RECORD

APPENDIX TO APPELLANT'S BRIEF.

IN THE

United States Court of Appeals for the District of Columbia

649

United States Court of Appeals
For the
District of Columbia Circuit

FILED JAN - 7 1957

Joseph W. Stewart
CLERK

Nos. 13612 - 13613

RICHARD T. KEATING,
Appellant,

vs.

ROBERT C. WATSON, Commissioner of Patents,
Appellee.

Appeal from a Judgment in the United States District Court for the District of Columbia.

William E. Lucas,
135 South La Salle Street,
Chicago, Illinois,
Attorney for Appellant.

Of Counsel:
William L. Mathis,
1435 G Street, N. W.,
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IN THE DISTRICT COURT OF THE UNITED STATES
for the District of Columbia.

Richard T. Keating, *Plaintiff,* *vs.* Robert C. Watson, Commissioner of Patents of the United States, *Defendant.*	Civil Action No. 2321-54.

COMPLAINT FOR ISSUANCE OF LETTERS PATENT.

Plaintiff, Richard T. Keating, for his complaint against the defendant, Robert C. Watson, Commissioner of Patents of the United States, alleges:

1. Plaintiff is a citizen of the United States and a resident of Chicago, Cook County, Illinois.

2. Defendant is a legal resident of the District of Columbia, and is sued as Commissioner of Patents of the United States.

3. This complaint is filed in accordance with the Federal Laws as provided in 35 U. S. C. 101, 102 and 145.

4. An application for Letters Patent entitled "Deep Fryer," Serial No. 197,035, was filed in the United States Patent Office on November 22, 1950, by Richard T. Keating as inventor.

5. Said application has not been assigned, and plaintiff is owner thereof.

6. The said application was filed and prosecuted in accordance with the laws of the United States and the Rules of Practice of the Patent Office.

92 7. The said application includes eight claims, as follows:

"1. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes being of oval configuration with their height greater than their width and having internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of the cooking vessel, yet having substantially one square inch of surface area per cubic inch of combustion space.

"2. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes being of oval configuration with their height greater than their width and having internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of the cooking vessel.

"3. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes being of oval configuration with their height greater than their width and having internal combustion space with a volumetric capacity of between two and one-half and three cubic inches per square inch of area of the cooking vessel, yet having substantially one square inch of surface area per cubic inch of combustion space.

"4. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes being of oval configuration with their height greater than their width and having internal combustion space with a volumetric capacity of between two and one-half and three cubic inches per square inch of area of the cooking vessel.

"5. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes having internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of the cooking vessel, yet having substantially one square inch of surface area per cubic inch of combustion space.

93 "6. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes having internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of the cooking vessel.

"7. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes having internal combustion space with a volumetric capacity of between two and one-half and three cubic inches per square inch of area of the cooking vessel, yet having substantially one square inch of surface area per cubic inch of combustion space.

"8. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes having internal combustion space with a volumetric capacity of between two and one-half and three cubic inches per square inch of area of the cooking vessel."

8. The Primary Examiner rejected said claims, and his rejection was affirmed by the Board of Appeals on March 30, 1954.

9. No appeal has been taken from the decision of the Board of Appeals to the United States Court of Customs and Patent Appeals.

10. Plaintiff is entitled under 35 U. S. C. 101 to a patent containing said claims.

94 Wherefore, plaintiff prays that this Court adjudge that plaintiff is entitled, according to law, to receive a patent for said invention, as specified in the aforesaid claims; and that plaintiff have such other relief as to equity may seem just.

Richard T. Keating,
1220 W. Van Buren St.,
Chicago 7, Illinois,

By /s/ Lowell F. Hammond,
Attorney for the Plaintiff,
135 S. LaSalle Street,
Chicago 3, Illinois.

Of Counsel:

/s/ William E. Lucas,
135 S. LaSalle Street,
Chicago 3, Illinois.

/s/ William H. Mathis,
1435 G Street, N.W.,
Washington 5, D. C.

[Endorsed:] Filed May 28, 1954.

95 [Title of District Court and Cause—Case No. 2321-54]

ANSWER TO THE COMPLAINT.

To the Honorable Judges of the United States District Court for the District of Columbia.

1. The defendant admits the allegations of paragraph 1 of the complaint.

2. He admits that, as Commissioner of Patents, his official residence is in the District of Columbia and that he is sued in his official capacity.

3, 4, 5, 6, 7, 8, 9. He admits the allegations of paragraphs 3 to 9, inclusive.

10. He denies the allegations of paragraph 10.

Further Answering, the defendant states that the plaintiff is not entitled to a patent containing any of the claims set forth in the complaint for the reasons given and
96 in view of the references cited in the Examiner's statement and the decision of the Board of Appeals in the plaintiff's application. Profert of copies of the said statement, decision, and references is hereby made.

Respectfully submitted,

/s/ E. L. Reynolds,
Solicitor, U. S. Patent Office,
Attorney for Defendant.

[Endorsed:] Filed June 23, 1954.

97 [Title of District Court and Cause—Case No. 5540-55]

COMPLAINT FOR LETTERS PATENT.

Plaintiff, Richard T. Keating, for his complaint against the Defendant, Robert C. Watson, Commissioner of Patents, alleges:

1. Plaintiff is a resident of Chicago, Illinois.

2. Defendant is a legal resident of the District of Columbia, and is sued as Commissioner of Patents of the United States.

3. This complaint is filed in accordance with the Patent Laws of the United States, Revised Statutes, Sections 4886 and 4915 (U. S. Code, Title 35, Sections 102 and 145).

4. An application for Letters Patent was filed by the Plaintiff in the United States Patent Office on November 22, 1950, Serial No. 197,036, entitled Deep Fryer.

5. The said application was filed and prosecuted in accordance with the Laws of the United States and the Rules of Practice of the United States Patent Office.

6. The said application disclosed a new and patentable deep fryer, which had material practical advantages and was a substantial improvement in the art.

98 7. The said application included six claims, numbered 1 to 6, inclusive.

8. The Primary Examiner rejected said claims and his rejection was affirmed by the Board of Appeals on October 21, 1955.

9. No appeal has been taken from the decision of the Board of Appeals to the United States Court of Customs and Patent Appeals.

10. Plaintiff is entitled to a patent containing said claims 1 to 6, inclusive, in accordance with Section 102 of Title 35, U. S. Code.

Wherefore, Plaintiff prays that this Court adjudge that Plaintiff is entitled according to law to receive a patent for said invention, as specified in the aforesaid claims; and that Plaintiff have such other relief as to equity may seem just.

Richard T. Keating,
By /s/ J. Preston Swecker,
Attorney,
J. Preston Swecker,
938 Washington Building,
Washington, D. C.

Of Counsel:
William L. Mathis,
938 Washington Building,
Washington, D. C.

Lowell F. Hammand,
Loftus, Lucas and Hammand,
135 South LaSalle Street,
Chicago 3, Illinois.
Washington, D. C.

December 20, 1955.

[Endorsed:] Filed December 20, 1955.

99 [Title of District Court and Cause—Case No. 5540-55]

ANSWER TO THE COMPLAINT.

To the Honorable the Judges of the United States District Court for the District of Columbia:

1. The defendant admits the allegations of paragraph 1 of the complaint.

2. The defendant denies that he is a legal resident of the District of Columbia. He states that, as Commis-

sioner of Patents of the United States, he officially is a resident of the District of Columbia. He admits that he is sued as Commissioner of Patents of the United States.

3. The defendant admits that plaintiff's complaint is filed in accordance with U. S. Code, Title 35, Sections 102 and 145. He denies that it is filed in accordance with
100 Revised Statutes, Sections 4886 and 4915.

4, 5. He admits the allegations of paragraphs 4 and 5 of the complaint.

6. He denies the allegations of paragraph 6 of the complaint.

7, 8, 9. He admits the allegations of paragraphs 7, 8, and 9 of the complaint.

10. He denies the allegations of paragraph 10 of the complaint.

Further Answering, the defendant states that plaintiff is not entitled to a patent containing any of claims 1 to 6, inclusive, of his application here involved for the reasons given and in view of the references cited in the Examiner's answer and the decision of the Board of Appeals in said application. Profert of copies of said answer, decision, and references is hereby made.

Respectfully submitted,

/s/ C. W. Moore,
Solicitor, U. S. Patent Office,
Attorney for Defendant.

[Endorsed:] Filed February 7, 1956.

101 [Title of District Court and Cause]

ORDER CONSOLIDATING ACTIONS.

These causes were heard on Plaintiff's motion to consolidate them, and it appearing that the Defendant has no objection to such consolidation, that both of the above-entitled actions involve common facts, and that consolidation thereof will tend to reduce unnecessary expense and delay, and the Court being fully advised, it is

Ordered, that the above-entitled actions be and they are hereby consolidated, the consolidated action to take the place on the calendar of Civil Action No. 2321-54.

/s/ R. C. Keech.

April 6, 1956.

[Endorsed:] Filed April 6, 1956.

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102 [Title of District Court and Cause]

MEMORANDUM BY THE COURT.

Wilkin, *District Judge* (By Designation):

These are two actions under 35 USC 145, consolidated for trial, by which the plaintiff seeks a decree of this Court, in action 2321-54, authorizing the allowance of claims 1 to 8, inclusive, of his application for patent Serial No. 197,035, and in action 5540-55, a decree authorizing the allowance of claims 1 to 6, inclusive of his application Serial No. 197,036, which claims were refused by the Board of Appeals.

The subject matter of the two Keating applications is a commercial deep fat fryer as used generally in restaurants, hotels, etc. A deep fat fryer is generally comprised of a supporting cabinet, gas burner apparatus, a frying vessel, a drain and drain spout for draining off contaminated cooking fats from the frying vessel, and a door at the front of the cabinet providing access to the drain spout.

The first application, Serial No. 197,035, is gener-
103 ally directed to the structure of the gas-fired heating elements of the fryer.

The second application, Serial No. 197,036, relates to the structure of the drain for removing the fat and debris from the cooking vessel.

Plaintiff's first application provides for combustion flues extending transversely through the vessel intermediate the top and bottom, the flues being oval in cross section with their height greater than their width, and having internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of the cooking vessel, and having substantially one square inch of surface area per cubic inch of combustion space.

The plaintiff's second application provides a drain and drain spout for draining off contaminated cooking fats, and a door at the front of the cabinet providing a more accessible and more convenient method of draining.

The Patent Office denied both applications, holding as to the first that it was not a matter of invention over prior practice or the disclosure of the patents to Kells and O'Dowd, to proportion the tubes as stated in the claims, since such proportions are within the realm of skill of the worker in the art, and easily arrived at by routine experimentation. And as to the second application, the Patent Office held that it was not a matter of invention over prior practice or the Pappas or Swindell patents, to place the drain nearer the front of the cabinet; nor was it invention to place the drain conduit and valve at an angle. And the Patent Office held that the convex shape of the door was merely a matter of design.

The evidence was quite clear that plaintiff's device 104 was an improvement over prior fryers, and that it had attained commercial success. A cursory examination of the exhibits exemplifying the plaintiff's device revealed the reason why it had been accepted. It is more convenient, and the evidence revealed that it was more economical in use. In spite of those facts, however, the exhibits and the testimony failed to convince this Court that the accomplishments of the plaintiff arose to the dignity of invention, as defined in the law. These cases fall into that class of regrettable cases where improvements are made which are beneficial, yet do not show sufficient originality or novelty to merit a patent monopoly. An old adage says, Build a better mouse trap and the world will make a path to your door. But unfortunately the world does not always grant a patent.

The authorities are abundant that not all improvement is invention and entitled to protection as such. Some improvements are only matters of degree or change of design or proportions, the results of which would be apparent to anyone of ordinary skill. The distinguishing features of the applicant's product must be new and original (invention), or must show an unexpected result (discovery).

The plaintiff's evidence fails to sustain the burden imposed by *Abbott, et al.* v. *Coe,* 71 App. D. C. 195, 109 F. 2d 449. A consideration of all the evidence and the briefs brings this Court to a concurrence with the conclusion of the Patent Office.

Judgment for defendant. Complaints dismissed at plaintiff's costs. Counsel for defendant may prepare findings of fact, conclusions of law, and a final judgment order.

/s/ R. N. Wilkin,
U. S. District Judge.

Washington, D. C.,
July 30, 1956.

[Endorsed:] Filed July 31, 1956.

106 [Title of District Court and Cause]

FINDINGS OF FACT.

1. These are two actions under 35 U. S. C. 145, consolidated for trial, by which the plaintiff, Richard T. Keating, seeks a decree of this Court, in action 2321-54, authorizing the allowance of claims 1 to 8 inclusive, of his application for patent, Ser. No. 197,035, for Deep Fryer, and in action 5540-55, a decree authorizing the allowance of claims 1 to 5, inclusive, of his application, Serial No. 197,036, for Deep Fryer, which claims were refused by the Board of Appeals.

2. Plaintiff's application, Ser. No. 197,035, relates to a deep fryer of the gas-heated type having combustion flues extending transversely through the vessel intermediate the top and bottom, the flues being oval in cross section with their height greater than their width. The flues have internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of
107 the cooking vessel, yet have substantially one square inch of surface area per cubic inch of combustion space.

3. The plaintiff's application, Ser. No. 197,036, relates to a deep fryer comprising a supporting cabinet, gas burner apparatus, a frying vessel, a drain and drain spout for draining off contaminated cooking fats from the frying vessel, and a door at the front of the cabinet providing access to the drain spout.

4. The patent to Kells, No. 2,429,360, relates to a deep fat fryer of the gas-heated type having combustion flues extending transversely through the vessel intermediate the top and bottom. It discloses, in Fig. 9, a flue which is oval in cross section, with the height greater than the

width. The patent points out that it has for an object to provide a high rate of heat generation in the limited combustion space available. There is also a drain.

5. The patent to O'Dowd, No. 2,429,360, relates to a liquid heating apparatus of the gas fired variety, intended for cooking purposes, such as deep fat frying. It includes an open top cooking vessel with a plurality of horizontal combustion tubes extending transversely through the vessel. The tubes are oval in cross section.

6. The patent to Pappas, No. 2,528,776, relates to a deep
fat frying apparatus enclosed in a cabinet having a
108 door. The frying container has sloping bottom walls
at the lowest point of which is a drain conduit and
valve. A drain pan is kept within the space at the bottom
of the housing.

7. The patent to Swindell, No. 366,701, relates to a gas stove with a drip pan sloping toward the front of the stove where there is a spout to drain into a receptacle placed therebelow.

8. Plaintiff's device is commercially successful and is an improvement over prior art devices.

9. It was not a matter of invention to proportion the tubes as stated in the claims of Civil Action No. 2321-54, over the disclosure of either of the patents to Kell or to O'Dowd, since the proportions stated are within the realm of skill of workers in the art, and easily arrived at by routine experimentation.

10. It was not a matter of invention over prior practice or the Pappas or Swindell patents to place the drain nearer the front of the cabinet; nor was it invention to place the drain conduit and valve at an angle.

11. The convex shape of the door for the cabinet was not a matter of invention, being merely a matter of design.

12. None of the claims in suit in application Serial
109 No. 197,035 define anything inventive over the prior
art.

13. None of the claims in suit in application Serial No. 197,036 define anything inventive over the prior art.

Conclusions of Law.

1. Mere improvement over the prior art does not warrant the grant of a patent in the absence of invention.

2. Plaintiff is not entitled to a patent on any of the claims of application Serial No. 197,035.

3. Plaintiff is not entitled to a patent on any of the claims of application Serial No. 197,036.

4. The complaints should be dismissed as to both Civil Action No. 2321-54 and Civil Action No. 5540-55.

/s/ Robert N. Wilkin,
Judge.

[Endorsed:] Filed August 24, 1956.

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105 [Title of District Court and Cause]

JUDGMENT.

This action came on to be heard at the April term and thereupon upon consideration thereof, it is this 24 day of August, 1956,

Adjudged that the complaint be and it is hereby dismissed, with costs against the plaintiff.

/s/ Robert N. Wilkin,
Judge.

Approved as to Form:
/s/ William L. Mathis,
Attorney for Plaintiff.

[Endorsed:] Filed August 24, 1956.

110 [Title of District Court and Cause]

NOTICE OF APPEAL.

Notice is hereby given this 10th day of October, 1956, that Richard T. Keating, plaintiff above named, hereby appeals to the United States Court of Appeals for the District of Columbia from the judgment of this Court entered on the 24th day of August, 1956 in favor of Robert C. Watson, Commissioner of Patents of the United States, against said Richard T. Keating.

Swecker & Mathis,
By William L. Mathis,
Attorneys for Plaintiff.

Of Counsel:
Loftus, Lucas and Hammand,
William E. Lucas.

[Endorsed:] Filed October 10, 1956.

TRANSCRIPT OF PROCEEDINGS.

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16 Mr. Lucas: I offer in evidence as Plaintiff's Exhibit No. 1 a certified copy of the file wrapper in Keating application, Serial No. 197,035, filed November 22, 1950.

17 Mr. Miller: No objection.

The Court: Received.

(File wrapper in Keating application Serial No. 197,035, marked and received in evidence as Plaintiff's Exhibit No. 1.)

Mr. Lucas: I offer in evidence as Plaintiff's Exhibit No. 2 a certified copy of Keating application Serial No. 197,036, filed November 22, 1950.

Mr. Miller: No objection.

The Court: Received.

(File wrapper of Keating application Serial No. 197,036, marked and received in evidence as Plaintiff's Exhibit No. 2.)

Mr. Lucas: If Your Honor please, I have here typewritten copies of the claims in each of these applications, as amended, and I prepared them as a matter of convenience, if Your Honor desires them.

The Court: Very well; I will be glad to have them.

Mr. Miller: No objection.

Mr. Lucas: If Your Honor please, I offer in evidence as Plaintiff's Exhibit No. 3-A Patent 1,630,309 to Pitman; as Plaintiff's Exhibit No. 3-B, a copy of Patent 2,176,869 to Childs; as Plaintiff's Exhibit No. 3-C, Patent 2,182,735 to O'Dowd; as Plaintiff's Exhibit No. 3-D, patent 2,429,360 to Kells, all of which were references in the first Keating application.

18 Mr. Miller: No objection.

The Court: They are all in your folder?

Mr. Miller: No, Your Honor, they are not all in there because we didn't finally rely on Pitman and Childs. The only ones that are in my folders are those that the Board relied on.

The Court: Kells and O'Dowd?

Mr. Miller: In one case there is Kells and O'Dowd, and in the other case there is Kells, Pappas, and O'Dowd, but I have no objection.

The Court: They will be received.

(Patent 1,630,309 to Pitman marked and received in evidence as Plaintiff's Exhibit No. 3-A.)

(Patent 2,176,869 to Childs marked and received in evidence as Plaintiff's Exhibit No. 3-B.)

(Patent 2,182,735 to O'Dowd marked and received in evidence as Plaintiff's Exhibit No. 3-C.)

(Patent 2,429,360 to Kells marked and received in evidence as Plaintiff's Exhibit No. 3-D.)

Mr. Lucas: I offer in evidence as Plaintiff's Exhibit No. 4-A Patent 366,701 to Swindell.

Mr. Miller: No objection.

(Patent 366,701 to Swindell marked and received in evidence as Plaintiff's Exhibit No. 4-A.)

Mr. Lucas: As Plaintiff's Exhibit No. 4-B Patent
19 2,528,776 to Pappas.

Mr. Miller: No objection.

Mr. Lucas: These were references on the second Keating application.

The Court: Received.

(Patent 2,528,776 to Pappas marked and received in evidence as Plaintiff's Exhibit No. 4-B.)

Mr. Lucas: Mr. Keating, will you take the stand, please.

Thereupon RICHARD T. KEATING, the Plaintiff, being first duly sworn, was examined and testified as follows:

Direct Examination by Mr. Lucas.

Q. Your name is Richard T. Keating? A. That is correct.

Q. Where do you now live? A. Oak Park, Illinois.

Q. How old are you? A. 48.

Q. Are you the Richard T. Keating who filed applications Serial Nos. 197,035 and 197,036 in the Patent Office, which applications are here involved? A. I am.

20 Q. What is your occupation? A. I am President of the Specialties Appliance Corporation, and the Managing Director of Frying Equipment and Supply Company.

Q. And where are the principal offices of those concerns located? A. 1210 West Van Buren Street, Chicago.

Q. And how long have you held those positions? A. Since approximately 1939; I don't have the exact date.

Q. Will you tell us just very generally what the business of the Specialties Appliance Corporation is? A. Specialties Appliance Corporation manufactures commercial deep fat fryers including restaurant fryers but they also manufacture large potato chip machines, nut roasters, and other similar devices.

Q. And what is the principal business of the Frying Equipment and Supply Company? A. It is the distribution and sale of the Keating Fryer.

Q. How long have you held these positions with these concerns. A. Since 1939.

Q. What was your education? A. Bachelor of
21 Engineering at Johns Hopkins University, Baltimore,
Maryland.

Q. Mr. Keating, I call your attention to two fryers which are here in the courtroom and which I will ask to be marked as Plaintiff's Exhibits 5 and 6. They now bear tags; if they could be marked by the Clerk.

(The 14-inch square model fryer was marked Plaintiff's Exhibit No. 5.)

(The 10 by 11 model fryer was marked Plaintiff's Exhibit No. 6 for identification.)

By Mr. Lucas:

Q. I will ask you if you are familiar with those fryers? A. I am.

Q. Do those fryers correspond in structure to the disclosure of the first Keating application 197,035? A. They do.

Q. By whom were they made? A. Specialties Appliance Corporation.

Q. Using those fryers will you please explain to the Court the basic elements of the fryer? First, let me ask you this: Will you tell the Court the difference between the two fryers? A. The two fryers?

Q. Yes. A. This fryer as compared to that fryer?

22 Q. That is right. A. The difference is mainly one of size and capacity. There is no substantial structural difference. One has a drawn vessel which is made in larger quantities than the other which has a welded structure.

Q. What size is the larger one, Plaintiff's Exhibit No. 5? A. The larger one is known as a 14-inch square model. The smaller one is 10 by 11 model.

Q. And the 14 by 14 represents what area? A. The inside dimensions of the frying vessel itself.

Q. Will you just explain that to the Court?

(The witness left the stand and stood in front of Plaintiff's Exhibits 5 and 6.)

The Court: Would it help if I came down there?

The Witness: I was going to tilt it so you could see.

The Court: I can step down there.

A. This is described as the fat containing vessel. It is heated by means of these tubes or flues in which combustion takes place.

The fat below these tubes is cold. For instance, I could hold a match here and it wouldn't burn; if I held my hand right there it wouldn't be hot. Crumbs and the debris and sediment and slivers from potatoes settle into

23 that cold zone, so they don't burn and thereby contaminate the fat.

One of the things which it makes possible is the preparation of fish and French toast in the same fat because the crumbs haven't given the fat a burned fishy taste.

Now here is the thermostat control that is mounted adjacent to the tube, which is controlled by a dial which has numbers on it so that the operator can set this to the desired temperature and it shuts on and off when the desired temperature is reached.

These are gas burners which project the flame into these heat transfer tubes.

This is the cock used to light the pilot lights; this is the main pilot cock; this is the thermostatic control.

How far do you want me to go?

Mr. Lucas: I think that is satisfactory.

The Court: Do you want to talk about the drain now?

Mr. Lucas: If Your Honor please, we would prefer to take it up later.

The Witness: Why don't we look at it while we are here?

Mr. Lucas: Well, let's proceed then and describe the drain.

24 The Witness: This is the drain. The drain in the two fryers is a little different because with the drawn vessel we can't come down straight in the front to get the funnel-like effect which we have in this drain.

On the larger model they are made of this same thing. They all use this type drain so that it has a funnel-like effect to discharge this muddy-like deposit of crumbs and food particles and settlement and material that collects.

The drain is operated by the valve.

Here is the front where these bags can be tied on so that the fat can be strained directly into a drain pail which sits on the floor in front of the fryer, because when that drain pail is full of hot fat it is a somewhat dangerous thing to move because the fat can splash and seriously burn someone. With this drain pail it is drained through the bag into the pail and the fat is poured back.

(The witness resumed the witness stand.)

By Mr. Lucas:

Q. Mr. Keating, prior to say 1949 what kind of tubes was your company using in the fryers it was making? A. We were using round tubes which were three inches in diameter.

Q. And will you explain to the Court the time cycles
that were involved in the operation of this fryer with
25 these round tubes? A. The preheat time, the time
to heat the fat, was approximately 18 minutes. The
time to fry a five-pound load of potatoes was 8 minutes,
and the recovery time was 3 minutes; that is, after the
potatoes were fried three more minutes were required to
bring the fat back to the starting temperature.

Q. Then what setting did you recommend for the thermostat on those fryers with these round tubes? A. The setting was somewhat standard over the years. In fact it was necessary that the dial be calibrated to 400 degrees. If the fryers were to be approved by the American Gas Association Laboratories it required that the dial be graduated up to 400 degrees, and the normal temperature settings were from 375 degrees to 400 degrees.

Q. Now, we are still talking about this fryer with the round tubes. Will you explain to the Court what happened to the fat when the food was immersed in it that is, after the fat had been brought up to this thermostat setting. A. Well, when we refer to food may I refer to one food rather than to all foods?

Q. Surely. A. When, for instance, the five-pound load
of potatoes was immersed in this vessel of fat the temperature would drop very rapidly. At the end of one
26 minute the temperature drop would approximate 100
degrees. It would reach its low point at the end of
approximately 2½ minutes. Now I must say "approximately" because different potatoes have different heat
requirements, and they are not a fixed, concrete piece of
material.

Then by the time the potatoes were completely fried the fat would heat back partially; it would return to approximately 305 degrees. Then as the food was removed the three minute interval was required to heat back at a rate of about 20 degrees in minutes was the recovery rate at that time.

Q. Mr. Keating, I show you two bulletins which have been marked as Plaintiff's Exhibits 7-A and 7-B; 7-A bearing the legend "Research Bulletin No. 24, American Gas Association Testing Laboratories," and bearing date March 1944; and Plaintiff's Exhibit No. 7-B bearing the legend "Research Bulletin 66, American Gas Association Laboratories", and bearing date May 1952. I will ask you what they are? A. These are two of a series of bulletins that have been published on research work which has been conducted in the American Gas Associations Laboratories in Cleveland.

This series covers all sorts of utilization, combustion, and design of gas burning or gas operated equipment.

27 Bulletin No. 24 deals with immersion tube heating.

The back section of this booklet deals with immersion tubes as applied to deep fat fryers and explains the maximum amount of heat that may be transferred, and a number of other things.

(Research Bulletin No. 24, American Gas Association Testing Laboratories, marked Plaintiff's Exhibit No. 7-A for identification.)

(Research Bulletin No. 66, American Gas Association Testing Laboratories, marked Plaintiff's Exhibit No. 7-B for identification.)

By Mr. Lucas:

Q. Will you tell us who makes up the American Gas Association? A. The American Gas Association is an organization of gas companies, and others gain membership through belonging to affiliated organizations such as the Gas Appliance Manufacturers' Association. Those members automatically become members of the American Gas Association.

Q. Will you tell us just generally about this laboratory that is maintained that is referred to there, the American Gas Association Laboratories? A. The laboratories are located on East 62nd Street in Cleveland, and they are equipped to run tests and gather information and gain results and make experimental models, and test the experimental models, as well as to test equipment which is manufactured by others.

28 There are two branches in the laboratories: That is, utilization or acceptability of equipment; and research or design of equipment.

Q. Are these publications available to non-members as well as to members of the Association? A. They are available to non-members.

Q. When did you receive those two documents, Plaintiff's Exhibits 7-A and 7-B? A. I received Bulletin No. 24 some time reasonably preceding March of 1944. I can't tell you the exact number of days or weeks, but it was about that date.

Q. What about Plaintiff's Exhibit No. 7-B? A. This I received in about June of 1952.

The Court: I understood you to say '44; did you mean '54?

The Witness: There are two bulletins. One is 1944; the second one is 1952.

The Court: Very well.

Mr. Lucas: If Your Honor please, I offer in evidence Plaintiff's Exhibits 5, 6, 7-A and 7-B.

Mr. Miller: No objection.

The Court: Received.

(The exhibits heretofore marked for identification were received in evidence as Plaintiff's Exhibits 5, 6, 7-A and 7-B.)

By Mr. Lucas:

29 Q. Mr. Keating, I hand you a copy of the Kells patent, which has been received in evidence as Plaintiff's Exhibit No. 3-D.

I also call your attention to the deep fryer model which is here in the court room and which has been marked Plaintiff's Exhibit No. 8. Will you please, using the patent drawing and Plaintiff's Exhibit No. 8, explain to the Court the structure of the device?

A. This is an open-top fat receiving vessel.

Q. By "this" you mean Plaintiff's Exhibit No. 8? A. Plaintiff's Exhibit No. 8 is an open-top fat receiving vessel which has within the vessel many heat-transfer tubes. It has two sets of four tapering tubes which are longer in the front than they are at the bottom.

This structure of Plaintiff's Exhibit No. 8 is strikingly similar to the drawings shown on the Kells patent.

Again, this fryer heats the fat by means of heat burned within the tubes, and has a drain in the bottom.

In that respect it is very similar to the other exhibit.

Q. Mr. Keating, was a structure such as Plaintiff's Exhibit No. 8 ever commercially made and sold? A. It was.

Q. By whom? A. By the Wolfe Range Company.

30 Q. Where are they located? A. In Los Angeles, California.

Q. How far back does the manufacture and sale of a fryer such as Plaintiff's Exhibit No. 8 go, just generally. A. In approximately 1944 to 1947; in that period of time was when I first became aware of it.

Q. Have you made any tests on Plaintiff's Exhibit No. 8? A. I have.

Q. Will you please tell the Court what you did, and the results? A. I filled the fryer with fat. I sized the gas burner orifices so that I could get the maximum heating effect.

The preheat time for this device was 14 minutes and 10 seconds; the frying time was 7 minutes and 5 seconds for a five-pound load of potatoes; and the recovery time was 2 minutes and 45 seconds to heat the fat back up to the starting temperature.

Q. Are you familiar with a fryer which was made by the Pitman Company and called the Fryolater? A. I am.

Q. Was that fryer made and sold commercially?
31 A. It was.

Q. About how far back does it date, as far as you know? A. The present Pitman Company was organized in 1935, and it has made and sold a similar device since that time.

Q. What configuration was the cross section of the tube in this fryer? A. They made both round tubes, as we did, and in recent years changed to oval tubes similar to those found in Plaintiff's Exhibit No. 8, except they did not taper; they were straight cross section.

Q. Did you ever make any tests on the Pitman fryer as constructed in the 1940's? A. I did.

Q. Will you tell the Court what you did and what the results were? A. We filled the fryer with fat, adjusted the burner so that we could get the maximum heating effect. We found that that fryer had a preheat time of 16 minutes; a frying time of 7 minutes; and a recovery time of 2½ minutes for a five-pound load of the particular potatoes that we used for testing at that particular time.

Q. Mr. Keating, I show you a photostat copy of the drawing in the first application, 197,035, and call your specific attention to Examples I to IV thereon.
32 Did you make the tests and the calculations, the results of which appear on the drawing and are set out in the specification?

A. I did.

Q. And to the best of your knowledge are the results there stated correct? A. They are.

Q. In the 1940's did you conduct many tests and experiments to attempt to improve the performance of the deep fat fryer? A. We did. We constructed many sample fryers that could be tested.

We made fryers with tubes that had reverse flow so that the gas would return, endeavoring to get more heat from the gas.

We made tubes above tubes, in banks, attempting to make the fat get hot more rapidly.

We made many different, or several different, sizes of round tubes, proceeding up to a single large round tube that would fit into the fryer.

Many different tests were made of deep fat fryers and many different structures were fabricated.

Q. How did you arrive at the construction which is exemplified in Plaintiff's Exhibits 5 and 6? A. There is hardly a logical explanation. I can surmise that we
33 envisioned the two round tubes, one above the other,
which were very difficult to clean, and wanted to see what would happen if we joined them to eliminate that section that was very difficult to clean; but I can give you no logical reason that was conceived before we made the device. After it was made I can tell of plenty of reasons, but before we made it I have none.

Q. What is the ratio of the combustion volume to the cooking area in, say, Plaintiff's Exhibit No. 6, which is the 10 by 11 model? A. Mr. Lucas, I don't have the figures here; you will have to get them for me.

Q. I will ask you if you have made a calculation as to ratios of that combustion volume? A. Yes, I have.

Mr. Lucas: I will ask that this be marked Plaintiff's Exhibit No. 9 for identification.

(A sheet entitled "Ratios of Combustion Space to Cooking Area and Heat-Transfer Surfaces on Various Sized Keating Fryers" marked Plaintiff's Exhibit No. 9 for identification.)

By Mr. Lucas:

Q. I show you a schedule which has been marked Plaintiff's Exhibit No. 9 and ask you what that is. A. These figures represent the calculations of the ratios between
the combustion space in cubic inches to the cooking
34 area in square inches, and the combustion space in cubic
inches to the heat-transfer surfaces in square inches.

Q. Will you tell us what you mean by "combustion volume" or "combustion space?" A. Combustion space is the cubic content of the chamber of the heat-transfer tube. That's the cubic content in cubic inches of the tube itself.

Q. What do you mean by "cooking area?" A. "Cooking area" is the open section at the top of the deep fat fryer into which the baskets are placed.

Q. That is the horizontal part? A. The horizontal plane covering the top of the cooking area.

Q. What do you mean by "heat-transfer surfaces?" A. Those are the outside surfaces of the heat-transfer tubes where those surfaces are exposed to the fat.

Q. What are both ratios on Plaintiff's Exhibit No. 6, which is the model 10 by 11 fryer? A. That ratio is 2.6 to 1.

Q. That is the first ratio? A. That is right.

Q. That is the combustion volume to cooking area? A. Correct.

Q. What is the second, which is "combustion space
to heat-transfer surface?" A. That is 1 to 1; that is,
35 there is 1 cubic inch of transfer area to 1 cubic inch
of combustion space.

Q. Is that second ratio exact or approximate? A. Well, it is very close to being exactly this.

Q. What is the ratio on Plaintiff's Exhibit No. 5, 14 by 14? A. The ratio of the combustion space to the cooking area is 2.80 to 1.

Q. And the other ratio? A. The ratio, combustion space to heat-transfer surface is 1 to 1.

Q. Do you make any other size fryers of the same construction as Plaintiff's Exhibits 5 and 6? A. We do.

Q. What size are they? A. They are 18 by 18; 20 by 20; and 24-inch square.

Q. Will you give the same ratios for these other models? A. The 18 by 18, the ratio of combustion space to cooking area is 2.91 to 1, and the ratio "combustion space to heat-transfer surface" is 1 to 1.

In fact, all of the ratios of "combustion space to heat-transfer surface" are 1 to 1.

The 20 by 20, the combustion ratio is 2.62 to 1; and in the 24-inch square it is 2.73 to 1.

36 Mr. Lucas: If Your Honor please, I offer in evidence Plaintiff's Exhibit No. 8 which is the fryer model and Plaintiff's Exhibit No. 9 which is the chart.

Mr. Miller: No objection.

The Court: Received.

(The fryer model heretofore marked for identification received in evidence as Plaintiff's Exhibit No. 8.)

(The chart heretofore marked for identification received in evidence as Plaintiff's Exhibit No. 9.)

The Court: Has Plaintiff's Exhibit No. 9 been marked?

The Deputy Clerk: Yes, sir.

The Court: Very well.

By Mr. Lucas:

Q. Mr. Keating, will you please state what results are obtained with fryers such as Plaintiff's Exhibits Nos. 5 and 6 with respect to this third period of time we have been talking about, recovery time? A. This third period of time, recovery time, has been eliminated completely. The recovery time has been completely combined with the cooking time, and there is no separate recovery time.

Q. Is the thermostat satisfied before the cooking of a
normal load of food is completed? A. The thermo-
37 stat is satisfied and does cycle off before the normal
load of food is completely cooked.

Q. Will you explain please what this provides in the way of continuous operation; that is, a cook during a meal period in a restaurant, using a Keating fryer.

The Court: Before he answers that question I wish he would amplify his other answer.

How is it that after that heat is brought up to the cooking point, when the cooking is completed there is no time consumed in lowering the temperature of the fat—the recovery period.

The Witness: The cycle normally goes from an immersion temperature—the temperature drops excessively very quickly when the food is put in. With the previous deep fat fryers it recovered very slowly, so that it never did get back up to the starting temperature by the time the food was completely cooked.

With this fryer it gets back to the starting temperature before the food is completely cooked and cycles off. It may even cycle on and off several times after it cycles off, but it has enough heat to satisfy completely the requirements of cooking the food within the length of time it takes the food to cook, which is something that never existed.

The Court: Is not the cooking temperature above the
temperature of the fat prior to the time the potatoes
38 are placed in the fat?

Do I make my question clear?

The Witness: No.

The Court: You increase the temperature of the fat to do the cooking, do you not?

The Witness: Let's go back to the very original type of deep fat fryer which was, namely, a pot of fat. In that instance you would have a basket and a pot of fat which you would put on the stove. You would heat that fat until it got very hot and then you would put the food in the fat. Therefore, when the food went in the temperature would cool off; the fat got cold.

Then would you repeat your question again because I didn't quite get it.

The Court: Well, my question is directed to this:

Do you not have to have a cooling off period after the potatoes are cooked? Don't you have to bring the fat down again?

From your testimony I took it that when that comes back up it stays there and you want to hold it there.

The Witness: It is extremely desirable during busy periods in a restaurant that that fat be maintained at a certain relatively high level of temperature so that it is ready for the next succeeding batch of food. You see, a restaurant receives many orders—

39 The Court: And the cooking period is what it should be for the next batch of food.

The Witness: The next batch of food should cook the same as the previous batch of food. Each batch should experience the same cycle; that is, the temperature should drop and come back up.

The Court: I understand it now. I was misled by the use of your term "recovery period." I thought maybe there was a declining period bringing the fat down after the food was cooked.

The Witness: No. May I explain it again?

The cycle consists of three parts: The preheat time to heat the fat up to cooking temperature; the frying time, which is the interval required to fry the food itself; the recovery time, which is the time required to restore the fat to the original high immersion temperature, and it is that waiting time while the fat heats up that has been eliminated that I was referring to a little while ago.

The Court: I understand it now.

By Mr. Lucas:

Q. Mr. Keating, what temperature do you recommend for the setting of the thermostat in the Keating fryer such as Plaintiff's Exhibits 5 and 6? A. We recommend that the thermostat be set between 325 and 335 degrees for the preparation of all foods.

40 Q. Does that represent a departure from the procedures that have been in effect, directions that have been normal given by, say, fat manufacturers, etcetera? A. Fat manufacturers still supply their customers with recipes which show very high initial starting or immersion temperatures. You cannot use such excessively high temperatures in this fryer for the food will cook on the outside but be raw inside because it doesn't cool off as much and it heats back more quickly.

Q. Are there any benefits that result from this lower thermostat setting? A. There are enormous benefits that result to the restaurant man.

Fat deteriorates in proportion or in relationship to the temperature to which it is heated. For example, if fat is heated for two and one half 8-hour days to 400 degrees with 10 percent of new fat added, the fat is no longer useful; it has been destroyed by temperature.

At 375 degrees it has a practical useful life of five days. At 350 degrees this would be extended to 7½ to 8 days; at 340 degrees this is extended to 11 days; at 337 degrees there is a critical point at which the deterioration of the fat slows up very abruptly, and it is possible below 337 degrees to use the fat indefinitely; it does not get black,

but not at higher temperatures with that amount of
41 fat added.

Q. Is the fat an economic consideration in the restaurant operation? A. The fat is an expensive ingredient. Top-quality fat today costs a restaurant man about 22½ to 23 cents per pound.

Q. How many pounds of fat are used in Plaintiff's Exhibit 5 which is the 14 by 14? A. 38 pounds of fat.

The Court: If that is a convenient place we will take the usual morning recess.

(Following short recess.)

The Court: You may proceed.

By Mr. Lucas:

Q. Mr. Keating, with the fryer such as Plaintiff's Exhibit No. 5, in 1950 what preheat time did you maintain? A. 7½ minutes to 375 degrees.

Q. That is from room temperature? A. From room temperature of 70 degrees to 375 degrees the preheat time was 7½ minutes.

Q. Mr. Keating, could you on the blackboard draw what might be called a graph to demonstrate the preheat time and the cooking time and the recovery time with both the old fryer of the 1940's, such as the round tube fryer
which you said your company made, and the Keating
42 fryer, such as Plaintiff's Exhibits 5 and 6?

May we do that, Your Honor?

The Court: You may.

(The witness went to the blackboard and placed a graph on the blackboard.)

The Witness: Your Honor, these should be connected with lines across; if you can envision those lines are there.

The Court: Yes.

The Witness: The first curve that I will draw will show the preheat time required to heat the deep fat fryer that Specialties Appliance Corporation manufactured in 1949, which starts at 70 degrees room temperature to 270 degrees, and the time required is 16 minutes.

When a batch of food is immersed in this—

By Mr. Lucas:

Q. May I interrupt? Is that 270 degrees? A. That is 370 degrees; I am sorry.

Q. What does that 370 represent? A. This represents preheat time, and 370 degrees represents temperature thermostat setting or temperature at which the food is immersed in the fat.

When the food is immersed the temperature of the fat drops very rapidly until it reaches 260 degrees.

260 degrees is the lowest temperature, and then less
rapidly with the food in the fryer it starts to fight its
43 way back against this heat loss until at 305 degrees
temperature, after an 8-minute interval, the potatoes
are fried but the fat is not hot, it is not ready for another load of food. That requires an additional time of 3 minutes to get back to 370 degrees.

If the cook places a full load of food before that gets back, the next succeeding curves are down a stairstep until the food becomes unsatisfactory for consumption, so he must either wait or he must use a lighter load of food.

Now, this is for the old fryer; that is the curve for the old fryer.

I said that the temperature setting used on Plaintiff's Exhibit 8 for cooking all foods is from 325 to 335 degrees.

Q. You mean Plaintiff's Exhibit No. 5. A. Any of them, they are all the same.

Q. Let's talk about Plaintiff's Exhibits 5 and 6. A. Any of the Keating fryers; they are all the same. So the preheat time to bring the temperature up from 70 degrees to the cooking or operating temperature at 325 degrees is but 5½ minutes; but this temperature is not so high as their temperature, but that is the new scheme of things; we cook at lower temperatures with this fryer.

When this batch of potatoes is placed in the fat 44 again the temperature drops very rapidly, but it drops not nearly so far; it drops from 325 degrees to 285 degrees as compared with from 370 degrees to 260 degrees. It heats back much more rapidly until it gets to the thermostat setting, the temperature at which you have selected to cook, at which time the thermostat cuts the gas off; it is hot, and it stops, and the food continues to cook at the maximum thermostat setting that you have decided you want to cook at, and the potatoes are fried in a 5-minute or a 4½-minute interval from raw as compared to an 8-minute interval from raw, with a temperature difference between 370 degrees and 325 degrees, which is 45 degrees difference in temperature.

Have you got any questions?

Mr. Lucas: No.

The Court: I understand what you are illustrating.

(The witness resumed the witness stand.)

Mr. Lucas: If Your Honor please, we would like to complete the first case before we go into the second one. We have some witnesses that we can accommodate that way too.

The Court: Very well.

Mr. Lucas: So we will want to recall Mr. Keating later. You may cross-examine.

Cross-Examination by Mr. Miller.

45 Q. Did you say when this device marked Plaintiff's Exhibit No. 8 was put on the market? A. I saw it between 1944 and 1947, and it became in general use during that period.

Q. That was long before you filed the application in suit, was it not? A. It was before we filed the application.

Q. And a cook could make French-fried potatoes with that, could he not? A. He could.

Q. And he could make good French-fried potatoes, couldn't he? A. A good cook could make good French-fried potatoes.

Q. In other words, you don't claim to be the first one that could make good French-fried potatoes? A. Absolutely not.

Q. Now, you fry French-fried potatoes in hot fat, don't you? A. You do.

Q. If the fat is too cool it won't cook them, will it? A. That is correct.

Q. You don't claim to have discovered that, do you? A. That is correct.

46 Q. And you stated that if you put the potatoes in fat that was too hot they would cook on the outside and be uncooked or raw in the middle. A. That is correct.

Q. You didn't discover that fact, did you? A. No, sir.

Q. Now, it wouldn't take a cook very long, would it, under those circumstances, knowing that if the fat was too cold the potatoes wouldn't cook, and if the fat was too hot that they wouldn't be cooked all the way through, it wouldn't take that cook very long would it, to find the temperature where the potatoes would be done to suit the cook? A. It really would depend on the cook, and it would be called the art of deep fat frying, depending on the skill or art, because he had to learn that very thing.

Q. Now you were talking about the patent to Kells. The patent to Kells describes a thermostat for regulating the temperature of fat, doesn't it? A. It does.

Q. And you say when you put a batch of potatoes in hot fat immediately the temperature of the fat goes down, does it not? A. It does.

Q. Now isn't it perfectly obvious that the only way to get the temperature back to where it was originally is 47 to put some heat into the fat? A. It is quite obvious.

Q. If your house is cold in winter the only way to get the rooms warm is to bring up some heat, isn't it? A. That is right.

Q. And isn't it perfectly obvious that the quicker you bring in the heat the quicker the temperature will get back to where the thermostat was set? A. Will you repeat that, please?

Q. Isn't it perfectly obvious that the quicker you bring back the heat into the place you want to heat the sooner the temperature will come back to the place where you want it? A. Yes, it is.

Q. Now, isn't it true that in this patent to Kells he quite distinctly points out how desirable it is to have a higher rate of heat transfer into this fat? A. Yes, he does.

Mr. Miller: That is all.

(The witness left the stand.)

Mr. Lucas: Call Mr. Daniels.

Thereupon JOHN SELLERS DANIELS was called 48 as a witness by the plaintiff, and being first duly sworn was examined and testified as follows:

Direct Examination by Mr. Lucas.

Q. Will you please state your name? A. My name is John Sellers Daniels.

Q. Where do you live, Mr. Daniels? A. I live at 4617 Thirty-sixth Street Northwest in Washington, D. C.

Q. Will you state your age, please? A. I am 53.

Q. What is your occupation? A. I am one of the vice presidents of the Hot Shoppes, Inc.

Q. And about how long have you held that position?

A. Since about 1942, I believe; 42 or 43, I don't know exactly.

Q. Do you have any financial interest in the Keating applications for patent that are here involved, or in the companies with which Mr. Keating is associated? A. No, sir.

Q. What is the business of the Hot Shoppes, Inc.? A. Well, we sell food right now. We hope to be in the motel business later, but now we are primarily concerned with selling food to the public.

Q. Is that as restaurants? A. That is right.

49 Q. About how many restaurants does Hot Shoppes, Inc. operate? A. 60.

Q. Will you tell us very generally where they are located? A. The majority of them are located here in Washington. We have some in Philadelphia; we have some airline feeding in New York and Chicago. We have some industrial feeding in Norfolk and Atlanta; Miami, Florida; Chicago, Illinois, and one restaurant in Salt Lake City.

The Court: And one near Fredericksburg.

The Witness: Yes; when I said the metropolitan area that includes Maryland and Virginia, of course, as well as Washington.

The Court: I mention it because I had lunch there recently.

The Witness: Fine. I hope it was good.

The Court: I travel between here and Charlottesville frequently.

The Witness: It is one of our newest ones.

The Court: Yes; I had a very good lunch there.

The Witness: Thank you, sir.

By Mr. Lucas:

Q. Mr. Daniels, does the Hot Shoppes, Inc. use any Keating deep fryers similar to the construction which
50 is contained in Plaintiff's Exhibits 5 and 6? A. Yes;
we use the larger one. I think Mr. Keating calls it the Keating Trump Fryer, which holds 38 pounds of fat.

We have 52 of these fryers in operation now in the Washington area, and I presume about 65 or 70 in the whole chain. I don't know exactly what is out of town; it would be around that figure.

Q. Over what period of time were those Keating fryers acquired, just generally? A. Well, we acquired them from the time they came on the market, and I am not exactly sure as to when they came on the market, whether it was 1950 or 1951.

As we replace the present fryers in our restaurants, as the fryers wear out we are replacing them with Keating fryers.

Q. Exclusively? A. Yes.

Q. In the late 1940's what fryers were the Hot Shoppes, Inc. using? A. We were using an electric fryer mostly; it was put out by Hotpoint and it was called—I think the first one they had was a 4 KW they called it, and then increased the heat input to 7 KW and then to 10 KW. We were using those almost exclusively when we decided
51 to change over to the Keating fryer.

Q. What thermostat setting does Hot Shoppes, Inc. use on the present Keating fryers? A. We found very satisfactory food cooked at from 325 to 335 degrees.

Q. In the 1940's do you know what the normally accepted practice was with respect to the thermostat setting on gas-fired deep fat fryers? A. About 375 to 385 degrees.

Q. On the present Keating fryers in the Hot Shoppes, Inc. restaurants, under a normal load is the thermostat satisfied before the cooking cycle is completed? A. Yes.

I think in most instances it is satisfied. The heat in the fat comes up to the thermostat setting before food is taken out of the deep fat fryer.

Q. Does that provide continuous operation by the cook? A. That is right.

Q. Do you know of any gas-fired deep fat fryer prior to these Keating fryers, such as Plaintiff's Exhibits 5 and 6, in which the thermostat was satisfied before the cooking was completed? A. I think we found that in all the cases which I was associated with it was not satisfied. It did
not get back to the frying temperature before the food
52 was ready to come out.

Q. Will you compare the Keating fryer, such as Plaintiff's Exhibit No. 5, and the commercially available prior gas-fired fryer of which you are aware as to fat savings. A. I can't truthfully say exactly how much fat that we do save. We do know this, that by using the Keating fryer and cooking at temperatures from 325 to 335 degrees the fat does not break down as fast; it does not become rancid; and we don't have to change it as often, and we do have a substantial savings, but I would have to go to one of our operations to know exactly how much; but our men have told us that there is a substantial savings in using the Keating fat fryer at this temperature rather than cooking at the higher temperatures that we had before.

Q. Does the lower thermostat setting result in any better product? A. We think so.

Mr. Lucas: You may cross-examine.

Cross-Examination by Mr. Miller.

Q. In your shops you used fryers before the Keating fryers were available, did you not? A. Yes, we did.

Q. Were you able to get satisfactorily fried foods
53 from those fryers? A. Well, that's a question of
what you call "satisfactory". We are always striving

to get a better food. We were not satisfied with the temperatures at which the fryers cooked the food.

Q. Have your cooks ever told you that if the fat is too cold it won't fry the food, or do you know that of your own information? A. I know that.

Q. Does a cook know that if the fat is too hot maybe it will burn the food? A. I think he does when he sees it smoking on the stove, most of them.

Q. And would he know that maybe if it weren't quite that hot so that it smoked that it would cook the food so fast that it would be done on the outside and not on the inside? A. I think he knows that from looking at the food, that's right.

Q. Then by looking at the food he gets out of it he can tell pretty well whether he is frying at too hot a temperature or too low a temperature, can he not? A. That is not always true.

Q. A wife can't tell when she looks in the oven whether her cake is burning or whether it hasn't started to
54 bake? A. I didn't understand the question.

Q. The wife can't tell by looking into the oven whether her cake is burning because the oven is too hot, or that it isn't baking because the oven is too low? A. I think she can tell by looking at the outside of it, but not the interior.

Q. But it doesn't take her very long, does it, to find out how hot to make the oven to bake it the way she wants it done? A. If you have the same wife using the same oven you probably wouldn't have that trouble.

Q. That would be particularly so, would it not, if you had any kind of regulator, such as a thermostat to regulate the temperature of the oven or cooking device? A. I didn't get your question.

Q. That would be particularly so, would it not, if you had a thermostat to regulate the temperature at which you were doing your cooking or baking? A. Not always, no.

Q. The thermostat doesn't help you out any in keeping your right temperature? A. Oh, surely it does.

Q. In the good old days my mother used to bake in an
old-fashioned coal stove. Now the question of getting the
right temperature to bake something hasn't changed a
55 bit. She didn't have a thermostat but she could
regulate the oven to get the temperature she wanted.
A. I don't think that is true. I think we have learned a
lot about baking in the last 20 or 30 years, that temperatures do improve the quality of products.

Q. But when you have a thermostat it is easier to keep the temperature you want, isn't it? A. It surely is.

Q. It has only been since, I believe you said, 1950 or 1951, that you have used Keating fryers? A. Since they came on the market, that's right.

Q. And I believe you said, did you not, that you are gradually replacing other fryers that you have by Keating fryers? A. Well, you can call it gradually if you want. We replace a fryer as a fryer is worn out, and when it comes to a point where we need to replace it with a new fryer we buy Keating fryers.

Q. You think the Keating fryer is better? A. That is right.

Q. But you don't think in those cases, do you, that the
old prior art fryers were so unsatisfactory that you have
to just dump them out and replace them right away with
the Keating fryers, do you? You wait until they wear
56 out, don't you? A. There is an economic problem involved there. As you know from running a group of
60 restaurants, where we have two to three fat fryers that
we couldn't throw them all out and put in all new Keating
fryers. As our fryers need replacing we replace them with
Keating fryers.

Q. But you use the old one because you can get acceptable fried potatoes, don't you? A. The potatoes I will say are not as good.

Q. But they are acceptable, are they not? A. Oh, sometimes they are and sometimes they are not.

Q. And if they are not right it was because the cook didn't use the right temperature? A. Not necessarily, no.

Mr. Miller: That is all; thank you.

(Witness excused.)

Mr. Lucas: Will you take the stand, Mr. Rulon?

Thereupon WATSON BIRDSALL RULON, JR. was called as a witness by the plaintiff, and being first duly sworn, was examined and testified as follows:

Direct Examination by Mr. Lucas.

Q. Will you please state your name? A. Watson Birdsall Rulon, Jr.

Q. Where do you live? A. 3525 Springland Lane,
57 Northwest, in the District.

Q. Will you state your age, please. A. I am 52.

Q. What is your occupation? A. I am a restaurant operator.

Q. And with what restaurant are you connected? A. With Hogate's in Washington and Arlington.

Q. That is Hogate's Seafood? A. Hogate's Seafood Restaurant.

Q. And Hogate's operates two restaurants? A. Yes.

Q. One in Washington and one in Arlington, Virginia? A. Yes, sir.

Q. How long have you held the position of manager at Hogate's? A. Since their inception in 1938; eighteen years.

Q. Do you have any financial interest in the Keating applications involved in this case, or in the companies with which Mr. Keating is connected? A. None at all.

Q. Does Hogate's use any Keating fryers of the same construction as Plaintiff's Exhibit No. 5, the 14 by 14 unit? A. The middle one?

Q. Yes. A. Yes.

58 Q. About how many of such fryers do you use today? A. In excess of 20; maybe 24 or 25, somewhere in there.

Q. Does Hogate's use the Keating fryer, such as Plaintiff's Exhibit No. 5, exclusively? A. Yes.

Q. Over what period of time have you acquired these Keating fryers, just generally? A. Well, we get back to the time, when did they come on the market? As soon as they came on the market we bought Keating fryers; it might have been 1951.

Q. Prior to the acquisition of these Keating fryers did Hogate's use gas-fired fryers of a different construction? A. Of a different make, yes, and construction, yes.

Q. Do you mind stating what that make was? A. It was the Pitman Fryolater Corporation.

Q. Would you just generally describe the tubes in the Fryolater as to the crowding of them? A. Well, it was the same essential immersion type unit; the tubes running through a container, passing heat through their surface into the surrounding fat. It was crowded with tubes always, as many as they could physically jam in the tube sheet.

59 Q. In the operation of the Keating fryer, such as Plaintiff's Exhibit No. 5, under normal load, is the thermostat satisfied before the cooking cycle is completed and the food removed? A. With our fryers, yes.

Q. Does the satisfying of the thermostat before the completion of the cooking time result in continuous operation of the fryers? A. Yes; that is continuous cooking operation; we don't have to wait.

Q. By "wait" you mean between successive batches, I take it. A. Correct.

Q. In the old fryers, prior to 1951, which you had at Hogate's, under normal load was the thermostat satisfied prior to the completion of the cooking time? A. Under normal full load, never.

Q. The question included "under normal full load." A. Never.

Q. Do you know of any deep fat fryer prior to Keating that is, prior to 1950 or 1951, in which the thermostat was satisfied prior to the completion of the cooking cycle? A. Under the same normal full load?

Q. Under the same normal full load? A. No; I was never able to learn of any.

60 Q. To what temperature did you set the thermostat on these old Fryolater fryers? A. Wide open; 375, 385, wide open; 400 if we could get it.

Q. Will you please explain to the Court what happened to the cooking temperature of the fat in these old fryers when the food was immersed in the hot fat? A. Let's assume that the temperature attained to start with was up in there. We put a cooking load in and it would come down. Before the thermostat ever came on the food had been cooked. Then without a waiting period, if the cook put another load in we stepped down here again and it was a constantly losing game of cooking temperature. Say on an hour's peak load, or less than an hour, we would get down into a very low grade cooking zone, never having attained the original desired temperature. This could be done if we waited, but when you get production you cannot wait. It was constantly a compromise with time and temperature.

Q. Were you dependent on the skill of the cook and judgment on loading when that situation developed? A. I guess "skill" is the word for it; as I intimated "compromise,'' it was a matter of judgment how soon you could get away and cook with the temperature that you had left at your command.

61 Q. At what temperature does Hogate's set the thermostat in the present Keating fryer? A. In the 325 to 335 range.

Q. Will you just tell the Court in your own words what the benefits are, if any, from using the thermostat setting in that range? A. Well No. 1, we get a higher quality food.

Economically, we haven't stressed the fat in that we haven't operated up in the critical range. You see, fat breaks down fast above 400, and if you are even up at 375 you are stressing it near its breaking point; so economically they offer great advantages, but primarily the quality of the food is superior to anything we were able to obtain with the preceding fryers.

Q. Will you state what your practice was with the old Fryolater fryers with respect to changing the fat? A. In, shall we say, the old days prior to the 1950-1951 days, in the Fryolater days, in the Pitman Fryolater days, if we got three days on the run of fat we were lucky. It was more between two and three days. Now we always exceed a week and we have got up to 10 and 11 days. In other words, the fat consumption is much less on the Keating than on the Fryolaters.

Q. How many of these old Fryolaters did Hogate's restaurants operate in one bank? A. Our standard
62 frying unit was four Pitman fryolaters, and I should point out they were larger in content, in fat capacity, than our present ones.

Q. Would you state what the capacity in pounds was in each of the four Fryolaters? A. Very close to 90 pounds.

Q. So that in a bank you would have 360 pounds? A. We would have 360 pounds of fat under heat at one station.

Q. When you replaced those with Keating how many Keating fryers did you place in the same bank or unit? A. We are now using three of the 14-inch Keatings; roughly, 38 pounds of fat, and they are doing the same job, at better quality, than the four 90-pound Pitman Fryolaters did.

Q. That is, each of the three Keatings has 38 pounds of fat which would be a total of 114 pounds, as I calculate it—well, we can do the multiplying. A. They are doing a superior job, three in a bank, than four of the old large monsters.

Mr. Lucas: You may cross-examine.

Cross-Examination by Mr. Miller.

Q. In your restaurant you were using fryers, were you not, before Keating fryers became available? A. Yes.

63 Q. And you could make acceptable fried potatoes with those fryers, could you not? A. I surely don't want to quibble on the word "acceptable." It was the best food that we could turn out at the time, but to be firm, it was not of the quality that we are able to turn out today.

Q. After all, doesn't the quality of fried food depend a great deal on the cook that is making it? A. Unfortunately, yes.

Q. And wouldn't you say that any cook would know that a fryer using fat, if the fat was too cold the food wouldn't be cooked? A. Yes.

Q. And most of those cooks would know, would they not, if they got the temperature away up, away up high, maybe it would even burn the food if they put it in? A. That is entirely true when it smoked and burned.

Q. Then they would observe, would they not, or at least they would think, would they not, that somewhere

between those high and low temperatures there would be a temperature which would do the job all right? A. That is exactly the point, sir. These machines will do it mechanically, automatically, whatever you call it, and before
it was a compromise between a not-too-skilled man's
64 judgment and the results that he was getting only
looking at the outside of the food and not the inherent
quality inside the food.

Q. But if he stuck a fork into it and saw it was raw inside he would know that he started too hot, wouldn't he, and that he should have started a little lower? A. But it was too late; that food had been served.

Q. But the next batch he would know, wouldn't he? A. The next batch, yes.

Q. The first batch would be spoiled, oh, surely. A. But one of our customers or guests has been displeased with that fare.

Q. Well, he wouldn't send it out without looking it over first, would he? A. I admit it, yes, we have done that. That builds or breaks the reputation of a restaurant.

Q. If a steak is burned on the outside he could see it and he wouldn't even send it out unless the customer wanted the steak very, very well done. A. Well, it leaves it up to the judgment of the cook which is undesirable.

Q. Now the fryers that you used previously to the Keating fryers had a thermostat on them, didn't they, for
regulating the temperature of the fat? A. Yes.

65 Q. Which if the cook once found the temperature
that he thought was the right temperature he could
set his thermostat and get that temperature again the next day, couldn't he? A. He could get the temperature that he had got the day before on that thermostat setting. Whether that coincided of course is the point.

Q. If you have a good thermostat in your house, and it is marked 70, you rely on the thermostat, don't you, when you set it at 70 to bring the temperature to 70? A. At home I do, sir, but not on cooking equipment.

Q. And the cook finds out pretty quickly, does he not, when he puts some cold food in hot fat that the temperature of the fat goes down? A. Yes.

Q. And when the temperature of a vessel of hot fat goes down there is only one way to bring it back where it was, namely, heat it up again? A. Yes.

Q. You have to put some more heat in? A. Correct.

Mr. Miller: That is all.

Mr. Lucas: Thank you.

(Witness excused.)

66 Mr. Lucas: If Your Honor please, we have one short witness whom we asked to come in right after lunch. We told him to be here at 1:30.

I would like to ask if we could adjourn at this point.

The Court: Would you wish to take up the other item with your witness?

Mr. Lucas: I would prefer not. I am sure we will finish today, because we just have the one more short witness and then a short coverage by Mr. Keating. I don't think we will run more than an hour after lunch.

The Court: That is agreeable. We usually adjourn until 2 o'clock.

Mr. Lucas: That would be agreeable.

The Court: Very well.

(Thereupon at 12:10 o'clock p.m. the trial was adjourned to 2 o'clock p.m.)

Afternoon Session.

67 (The hearing was resumed at 2:00 o'clock p.m., at the expiration of the luncheon recess.)

The Court: You may call your next witness.

Mr. Lucas: Mr. Edward Fineran, please.

Thereupon EDWARD V. FINERAN was called as a witness by the plaintiff and, being first duly sworn, was examined and testified as follows:

Direct Examination by Mr. Lucas.

Q. Will you state your name, please? A. Edward V. Fineran.

Q. Where do you live, Mr. Fineran? A. Silver Spring, Maryland.

Q. Will you state your age, please? A. 46.

Q. Will you tell us what your education was, just in college? A. Johns Hopkins University, graduated in 1931, Gas Engineering.

Q. What is your occupation? A. Industrial Sales Manager of the Washington Gas Light Company.

68 Q. That's located in Washington, D. C. A. That's right.

Q. And how long have you been with the Washington Gas Light Company? A. 25 years.

Q. Is that the gas distributing company in the City of Washington and in this area? A. That is correct.

Q. Had you had experience with commercial deep fat fryers? A. Yes.

Q. Over how many years has this experience run? A. About 18 years.

Q. During that 18 years have you observed many changes in commercial deep fat fryers? A. I have.

Q. Do you have any financial interest in the Keating applications for patents which are involved in this case or in the companies with which Mr. Richard T. Keating of Chicago is connected? A. None.

Q. Are you familiar with the Keating deep fat fryer such as is exemplified by the fryer in the courtroom here which has already been identified as Plaintiff's Ex-
69 hibit 5? A. I am familiar with it.

Q. And there is another Keating fryer, Plaintiff's Exhibit 6. Are you familiar with that? A. I am.

Q. Mr. Fineran, what happens to fat when it is heated to an excessive temperature? A. Deep fat used in frying breaks down more rapidly at higher temperatures.

Q. Prior to 1950 was it generally considered that there was a limitation on the differential between the temperature of the heat transfer surface of the tubes and the temperature of the fat in a deep fat fryer? A. That's correct. It was thought that if that temperature was too high it would accelerate the breakdown of the fat.

Q. Was that limitation a consideration in simply putting more heat into the tubes of the fryer? A. That was considered to be the major limitation on how much heat could be put into a fryer of a given size, shape heat transfer surface.

Q. Would that explain why people didn't put more heat into the fryers prior to 1950? A. I think that is correct, yes.

70 Q. Does the Keating fryer such as Plaintiffs' Exhibits 5 and 6 transfer more heat to the fat than any fryer made and sold prior to 1950 of which you are aware?

A. Of the same size and fat capacity?

Q. Comparable size, yes. A. That is certainly true.

Q. Does the Keating fryer overheat the fat where it comes in contact with the heat transfer surfaces of the tubes? A. No.

Q. Is the Keating fryer capable of frying more food than a comparable sized prior fryer? A. Yes.

Q. By "prior" I mean prior to 1950. A. Yes.

Q. Did the fryers of which you are aware of prior to 1950 have to undergo a recovery period after a normally full basket of food was cooked and removed from the fat? A. Yes.

Q. Now, will you please explain just what you understand the term "recovery period" as it has just been used to mean? A. When a full load of food was placed in the older model fryers, by the time the food was done the temperature of the frying compound had not yet reached
the temperature from which it started when the food
71 was placed in the fryer. Therefore, if the user im-
mediately put a second load of food in the fryer there was a step-by-step dropping in the frying temperature of the fryer with poor results on the finished product of the food.

Q. Does that occur in the operation of the Keating fryer such as Plaintiff's Exhibits 5 and 6? A. Not in the normal operation.

Q. In the Keating fryer, and when I use the word "Keating" understand I am referring to Plaintiff's Exhibits 5 and 6, is the thermostat satisfied before the cooking is completed? A. Yes.

Q. In 1950 which is the date when the Keating applications here involved were filed, did this represent a new cycle for deep fat fryers? A. For gas deep fat fryers, yes.

Q. I should have included that in the question. We are talking about gas heated deep fat fryers.

Prior to 1950 what thermostat setting was generally employed in the old type fryers in normal operation?

A. In the neighborhood of 375.

Q. That's Fahrenheit? A. That is correct.

Q. What thermostat setting is generally used in
72 the Keating fryer? A. 330, something like that.

Q. Does this lowered thermostat setting have any beneficial effect so far as the fat is concerned? A. The fat lasts longer at lower temperatures.

Q. When you first saw a Keating fryer and observed the construction of it such as in Plaintiff's Exhibit 5 and 6, was it obvious to you that it would produce the results that you have just specified? A. No.

Mr. Lucas: If your Honor please, we would like to go now to the second Keating application relating to the drain structure. I have a few questions for Mr. Fineran, and will recall Mr. Keating and then we will conclude.

The Court: Very well.

Before you change the subject, I would like to ask the witness: To what do you attribute the improvements that you have testified to?

The Witness: The much greater heat transfer to the frying compound.

The Court: And would that be from the construction of the tubes or burner?

The Witness: The construction of the tubes and the
73 burner are factors, but apparently it is the realiza-
tion of the fact that there isn't this limitation on the
amount of heat that can be put to the metal. Since there
isn't this limitation there isn't a fear of breaking down the
fat unduly by pouring this great amount of heat to it,
the greater production capacity is achieved.

The Court: You may go into the other subject.

By Mr. Lucas:

Q. Mr. Fineran, are you familiar with the drain structure such as is contained in Keating's fryers, Plaintiff's Exhibits 5 and 6? A. I am.

Q. Prior to 1950 did you see or are you aware of a deep fat fryer with the same or similar drain construction?

A. No, I have never seen one, hadn't seen one prior to that time.

Q. Will you state what beneficial results, if any, are obtained with this drain structure of Keating? A. In draining the deep fat from the fryer, by the drain being to the front, as contrasted with the drain being vertical from the middle of the bottom of the fryer, has placed it in a far more accessible position where the container is sitting on the floor out in front of the fryer and doesn't have to be slid from under the fryer after the hot
74 grease has drained into it.

The grease has to be at a high temperature in order to be fluid enough to drain, and it is frequently at such a high temperature as could readily scald a person if it splashed on them. That now and then happened with the old drainage system.

The ring around the end of the drain around which the bag is tied, which then holds the bag on to drain, is also a convenient item.

Q. Are you referring to the straining or filter bag? A. The filter bag, that is right. The fat should be strained before it goes back to the fryer, and this facilitates straining as it is drained from the fryer.

Also, of course, as happens when you have breaded food products, the bread crumbs tend to clog the drain, accumulate behind the drain valve. Sometimes when you open the drain valve nothing comes out. So the common procedure is to run a rod or something, a wire, up in there and move it around to break up the bread crumbs and start the flow.

That of course is much easier in that position than reaching back under the fryer, and less hazardous.

Mr. Lucas: You may cross-examine.

Cross Examination by Mr. Miller.

75 Q. Did you say that you were familiar with the gas fired fryers before the Keating fryer as in the Plaintiff's Exhibit on the right hand came on the market? A. That is correct.

Q. Did any of those fryers have a thermostat on them? A. Yes, sir.

Q. What is a thermostat for? A. To control the temperature of the frying compound.

Q. Is the thermostat commonly adjustable so you can set it at different temperatures to get it to regulate the temperature you want? A. Yes, sir.

Q. In your house you can set the gas burner to keep it at 80 or you can set it to keep it at 70, or you can set the thermostat to keep it at 65 if you like it cool? A. Yes, sir.

Q. Now, you spoke about the temperature of the fat in a deep fryer dropping when a batch of food was placed in the fat, did you not? A. Yes, sir.

Q. When that happens, is it supposed to be the function of the thermostat to bring the temperature up again to the value which you had originally set the temperature? A. Indirectly. Rather it turns on the fuel to bring it back up.

76 Q. And when the temperature is dropped, and you want to get the fat hotter, there is only one way you can do it, isn't there, and that's put some heat into the fat? A. Yes, sir.

Q. And you say the thermostat turns on the fuel and starts the burner going so it makes some heat and that works into the fat and raises its temperature? A. Yes, sir.

Mr. Miller: That's all.

Mr. Lucas: Thank you.

(The witness left the stand.)

Mr. Lucas: Mr. Keating.

Thereupon RICHARD T. KEATING, having been previously sworn, was recalled as a witness and testified further as follows:

Direct Examination (Resumed) by Mr. Lucas.

Q. You are the same Mr. Richard T. Keating who testified previously in this case? A. I am.

Q. Mr. Keating this morning in connection with the various sized deep fat fryers which Specialties Appliance Corporation manufactured, we neglected to ask you about
the number of tubes in each size model. Would you
77 please give us that? A. The 10 by 11 model has two
tubes. The 14″ model four tubes. The 18″ model four
tubes. The 20 square model five tubes.

Q. What are the over-all dimensions of these tubes? A. These tubes are three inches wide by five inches high. The, let's say, and surfaces are curved with a radius of one and one-half inches. That is, they are oval shaped tubes. They have a radius of one and one-half inches on the curved end of the tube.

Q. That's at the top and bottom? A. At the top and bottom.

Q. Will you state if you know whether or not when Hogate's Restaurant in Washington, D. C. purchased Keating fryers such as Plaintiff's Exhibits 5 and 6, did they use these fryers to replace operable other makes of fryers? A. They did. They replaced stainless steel fryers of another make that were operable at the time of replacement.

Q. Mr. Keating, are you familiar with the drains on the cooking vessels commonly used in deep fat fryers prior to 1950? A. I am.

Q. Will you explain the commonly used types of
78 drains, and if you have any models or devices that

would aid in that explanation, will you please use them? A. This drain—

Q. Just a minute. You now have in your hand a model which we will ask the Clerk to mark as Plaintiff's Exhibit 10.

(Drain marked Plaintiff's Exhibit 10 and received in evidence.)

By Mr. Lucas:

Q. Will you please explain what Plaintiff's Exhibit 10 is? A. This drain is the bottom cut of an actual deep fat fryer that was made prior to 1950. It is pitched toward the center. Different fryers had different slopes of pitch in order to feet [sic] the debris which washed off the food being fried, so that this debris would go down the hole.

With this type drain there was a considerable problem of a stoppage requiring that they run out or have something to poke through it because some of these particles were slivers of french fried potatoes. The potato being round when it is cut into square pieces for french fries there are long narrow pieces which remain in the fat until they are cooked hard. They fall and intermingle with these other crumbs which consist of bread crumbs, cracker meal, food particles that wash from the foods as they are
79 cooked. These relatively long narrow pieces block up the drain because each one of them has to turn a very substantial angle so it will go down, and they make a log jam like the beavers might make, and these particles jam up with such a drain as this.

This drain is similar to the drain which is in the center of this fryer excepting the drain in that fryer has a little flat section at the bottom which would aggravate that particular condition.

Q. When you referred to this fryer, you were referring to Plaintiff's Exhibit 8? A. Correct.

Here's another bottom—

Mr. Lucas: I will ask the clerk to mark this drain Plaintiff's Exhibit 11.

(Drain marked Plaintiff's Exhibit 11, and received in evidence.)

The Witness: With this drain the sludge, the food particles or debris settle on to a sloping surface. This drain is a front drain. It had been moved forward. This is one of the more modern fryers prior to 1950. So that the drain valve of this fryer became more accessible to the operator as compared to the drain on this Exhibit 8 where the operator has to get substantially under the fryer to operate the drain.

On this drain he just had to stoop down, get down and reach under a little bit.

80 Again these food particles would slide down these plane surfaces, and when they would get to this drain opening it would be like a log jam; there was nothing to aim them so that the long narrow pieces would go down the hole.

Q. Mr. Keating, is that Plaintiff's Exhibit 11 representative of the bottom of a cooking vessel that was used commercially in the deep fat fryer prior to 1950? A. It is. Do you care to know the name?

Q. I do. A. This was removed from a Pitco Fryolator.

Q. Mr. Keating, you now have in your hand another model which I will ask the clerk to mark Plaintiff's Exhibit 12. Will you please explain what that is?

(Drain marked Plaintiff's Exhibit 12, and received in evidence.)

The Witness: This drain is similar to the drain which is found on these Keating fryers which are marked Plaintiff's Exhibits 5 and 6. The variation between 5 and 6 is solely due to the fact that Exhibit Number 5 has a round vessel, obviating the opportunity of putting a square corner such as this because it has been drawn round from a physical standpoint, but the principal is exactly the same.

With this drain the food particles again settle to the bottom. Those particles which land on these side planes tend to align themselves as they slide down the plane.
81 When they reach this panel they tend to be lengthwise rather than crosswise.

This panel represents a chute which not perfectly but with reasonable practicality feeds those longer particles to the drain opening.

The reason we had to find a better means to drain the fryer was simply because there was no room to put the larger opening such as is found on this drain.

Q. You are referring to Plaintiff's Exhibit— A. 11, and also Plaintiff's Exhibit 10, because the mechanism, the burner structure and the parts of the fryer leave no room, there is nowhere to bring a larger drain out. Therefore, we had to devise a drain that would permit us to drain these same food particles through a smaller hole. And the only way that we could find was to use a means of aligning the long narrow particles so that they would go out the hole without continuous stoppage.

Q. What are the dimensions of the drain pipe on Plaintiff's Exhibit 12, the Keating drain as compared to the dimensions on the pipe of 10 and 11? A. The Keating drain pipe is a one inch drain pipe. That means one inch iron pipe size, one inch i.d.

Q. What do you mean by "i.d."? A. Inside diameter.

82 Q. Thank you. A Whereas the drains on the other two are one and a quarter inch inside diameter.

Q. Will you explain the straining or filtering operation on the Keating fryer 5 and 6 and the pail handling operation? A. There is no question about the desirability of frequent straining or filtering the frying fat. The more frequently it is done, the more desirable. The frequency with which it is done is limited only by the amount of labor involved in doing it.

The usual procedure is with the old fryers the fat is drained from the fryer. This Exhibit 8 is the only fryer that you can get it all into one bucket such as here, but it is necessary to get down and open this valve. The hot grease flowing through the valve itself, splatters when it hits the grease underneath, and as these lumps of food particles build up into dams as they come through, it splashes. So when it is all drained this bucket is now full of fat at a temperature in excess of 300°, and it is now necessary to move this fat out of the cabinet and pick it up. We then close the drain, but the fat is not strained. We either have to take a cheesecloth, put it over
another container and pour the fat into another con-
83 tainer, or we have to buy a special filtering device
which will fit on to this container so we can then pour
the fat from the filtering container into the fryer.

With the drain on the Keating fryer the drain is in a convenient location. Many times because this drain is obscure the operator would leave the drain open after he removed the fat. His concentration was demanded by moving this container of hot fat. Many times he would pour this fat back into the fryer with the drain valve open. It would be all over the floor, and a horrible mess. In fact, it was when I did that that the decision was made that we had to do something about that drain because it is a horrible mess to clean up five gallons of hot fat.

Now with the Keating drain, you can see on Exhibit 6 that the drain is exposed. It is in the open. Now with this type of drain it is possible to tie a bag immediately over the end of the pipe which entraps all of the fat, and crumbs stay in the bag, these food particles, debris, slivers of potatoes.

It is also possible to stick a saucepan if you can imagine a saucepan, ladle out saucepans of hot fat and flush all the debris which remained in the fryer into the bag. It only

remains necessary, therefore, to shut off the drain,
84 untie the bag, put the bag in the saucepan, so it is
out of the way, and pour the fat back into the fryer. It isn't necessary to pull the fat forward in order to pour it because you can pick it up and this is just a standard container that comes and is furnished with the fryers. It is a part of the fryer. Each fryer has such a container.

Q. Mr. Keating, has this drain construction been copied by others since you have commercially introduced this type of construction? A. It has. There are now four manufacturers using this drain.

Q. So far as you are aware was anybody prior to 1950 using this type of construction? A. No.

Q. Mr. Keating will you name some representative buyers of Keating fryers just generally? A. The Keating fryers are bought by especially busy restaurants, especially by chains such as the Hot Shoppes, Linton's in Philadelphia, the Slater Commissary System in Philadelphia, Toffenetti's Restaurants, the Union News in New York, John R. Thompson's, Foster Lunch Corporation in San Francisco, B & W Cafeterias, and the Keating Fryer only yesterday we received the first order from the Quartermaster Corps.

85 The Keating fryer is now in general use in the busiest of restaurants all over the country.

Mr. Lucas: Thank you. You may cross-examine.

Cross-Examination by Mr. Miller.

Q. Did you say that fryers which were in use prior to the Keating exhibits had a valve on the bottom to drain the frying fat out? A. Yes, sir.

Q. Did you say the valve on some of those was in a place where it was hard to get at? A. Yes, sir.

Q. Do you think if anybody finds a valve in a place that's hard to get at it takes very much ingenuity to move the valve to a place where you can get at it? A. I know that on fryers I moved the valve to the front as on Exhibits 10 and 11, and I know that within two years every fryer manufacturer copied that movement. Now maybe it didn't take any ingenuity. All I can say is that's what we did and that's what happened.

Q. Did you ever try to drain the water out of an automobile radiator? A. Yes, sir.

Q. Maybe some night when it was going to get cold and you hadn't anti-freeze in there yet. Well, there's a valve in there, isn't there, to let the water out? A. Yes,
86 sir.

Q. Where do they usually put the valve, way back? A. It seems to me it is in a very inconvenient location.

Q. Don't they usually put it up near the front of the automobile? Or do they put it way back in the engine where you have to get under and crawl backwards? A. Look, I don't want to be facetious, but believe me it is very inconvenient if you have drained the water out of an automobile. You will find it is located very inconveniently. I don't want to be facetious. I know what you want to do, but the example, I can't answer the example that is is easy.

Q. You don't know whether it is far back under the engine or up toward the front? A. It is up towards the front and it is immediately at the bottom of the radiator.

Mr. Miller: That's all.

Mr. Lucas: The plaintiff rests.

Mr. Miller: On behalf of the defendant I would like to introduce two folders which I have already handed up, the file wrappers with regard to Civil Action No. 2321-54 will be Defendant's Exhibit 1, and the file wrapper for Civil Action 5540-55 let that be Defendant's Exhibit 2, and that will be all the evidence on behalf of the defendant.

87 (File wrapper, Application of Richard T. Keating, Serial No. 197035 was marked Defendant's Exhibit 1 and received in evidence.)

(File wrapper, Application of Richard T. Keating, Serial No. 197,036 was marked Defendant's Exhibit 2 and received in evidence.)

Mr. Lucas: I would like to inquire as to what your Honor's desires are on oral argument and briefs.

The Court: You do not have a trial brief ready for filing now?

Mr. Lucas: No, sir.

The Court: Do you wish to file a brief?

Mr. Lucas: We do. We would prefer to argue it right now.

The Court: I doubt whether that is advisable. I would rather have your brief than an argument. It is more serviceable because in an argument you pass from one point to another, and if a brief is before me I can check one with the other and back and forth. It is better. I don't think it is necessary to do both. I would like to have your citations of authorities and your analysis of the evidence and your application of the evidence to the requirements of the patent law, a brief statement of what your contentions are, and what you rely on.

How much time do you wish?

88 Mr. Lucas: I would say 20 days after we get the transcript.

The Court: By the 10th of July?

Mr. Lucas: I think that would be satisfactory.

The Court: Can you file at the same time? It seems to me in this case you might make an exchange, and then if either wishes to file any additional brief to answer some point the Court would receive it of course within a reasonable time.

Mr. Miller: I could file also by July 10, your Honor.

The Court: Very well.

This is a case that presents pretty clearly, I think, the issue that arises when it is claimed by the Patent Office that the improvement which has been made, and it is conceded that it is an improvement, is just such a change from a former construction as would be obvious to the ordinary man working in that field. I think that's the only issue here.

Mr. Miller: Your Honor has the issue precisely.

The Court: And of course the plaintiff in a case of this kind has the handicap of the presumption in favor of the Patent Office which has been established. You have to overcome that.

Mr. Lucas: That is right.

89 The Court: This is the kind of a case that makes a trial judge wish sometimes that our patent law could be revised so that every man that makes an improvement would have a reward in proportion to the improvement he has made.

I understand, I have heard that some patent systems are arranged so that that is possible or at least they try to make it possible. In this country we don't have that state of law.

Many improvements have been made and have proved to be commercial, have been adopted to the advantage of a whole business in the whole country, and yet the man who made the improvement got no reward for what he did because he did not meet the standards which have been set for invention.

Mr. Lucas: Well, of course there have been many cases, but we think that hindsight has to be avoided. I don't have to say anymore.

The Court: I know. You have made the issue clear and nothing that I have said is to be construed as judgment on my part. I will keep an open mind until I have considered your brief carefully, but I said what I did merely to make the issue clear so it might help you in preparing you. You don't have to elaborate a lot of things that are not in issue.

Mr. Lucas: One minor matter. We unfortunately don't
have extra copies of some of these exhibits, but I am
90 sure that Mr. Miller and we can work out something.
We might want to have photostats made of them, but
we can work that out.

The Court: Oh, yes. There will be no difficulty about that, I am sure.

Mr. Miller: I don't think so.

The Court: We will adjourn until tomorrow morning at 10:00 o'clock.

(Whereupon at 2:45 o'clock p. m., the trial was concluded.)

* * * * *

EXAMPLE I

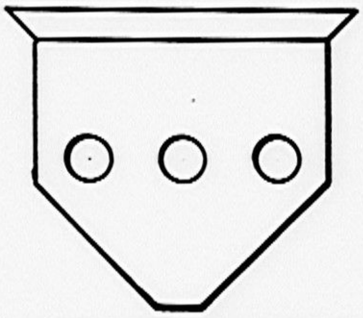


Fig.1

	1-TUBE	TOTAL
CROSS SECTION	3.14 Sq.In.	9.42 Sq.In.
PERIMETER (CIRCUMFERENCE)	6.28 In.	18.8 In.
VOLUME	43.9 Cu.In.	132. Cu.In.
SURFACE AREA	87.9 Sq.In.	264. Sq.In.
COMBUSTION SPACE PER Sq.In. COOKING AREA		.67 Cu.In.

EXAMPLE II

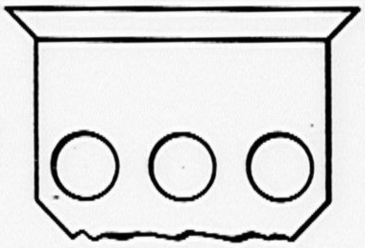


Fig.2

CROSS SECTION	7.07 Sq.In.	21.1 Sq.In.
PERIMETER (CIRCUMFERENCE)	9.42 In.	28.3 In.
VOLUME	98.8 Cu.In.	296. Cu.In.
SURFACE AREA	132. Sq.In.	396. Sq.In.
COMBUSTION SPACE PER Sq.In. COOKING AREA		1.5 Cu.In.

EXAMPLE III

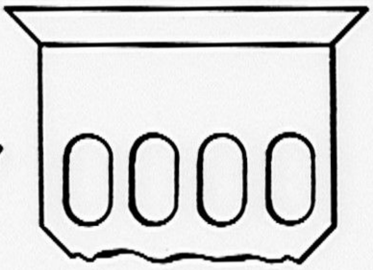


Fig.3

CROSS SECTION	7.14 Sq.In.	28.6 Sq.In.
PERIMETER (CIRCUMFERENCE)	10.3 In.	41.2 In.
VOLUME	100. Cu.In.	400. Cu.In.
SURFACE AREA	144. Sq.In.	576. Sq.In.
COMBUSTION SPACE PER Sq.In. COOKING AREA		2. Cu.In.

EXAMPLE IV

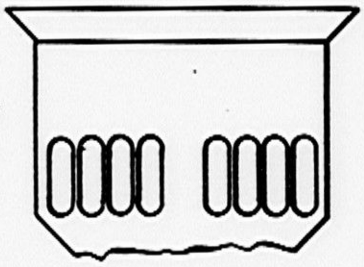


Fig.4

CROSS SECTION	3.27 Sq.In.	26.3 Sq.In.
PERIMETER (CIRCUMFERENCE)	8.14 In.	65. In.
VOLUME	46. Cu.In.	368. Cu.In.
SURFACE AREA	114. Sq.In.	912. Sq.In.
COMBUSTION SPACE PER Sq.In. COOKING AREA		1.9 Cu.In.

EXAMPLE V

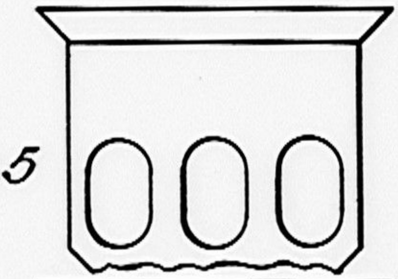


Fig.5

CROSS SECTION	13.1 Sq.In.	39.3 Sq.In.
PERIMETER (CIRCUMFERENCE)	13.4 In.	40.2 In.
VOLUME	183. Cu.In.	549. Cu.In.
SURFACE AREA	188. Sq.In.	563. Sq.In.
COMBUSTION SPACE PER Sq.In. COOKING AREA		2.8 Cu.In.

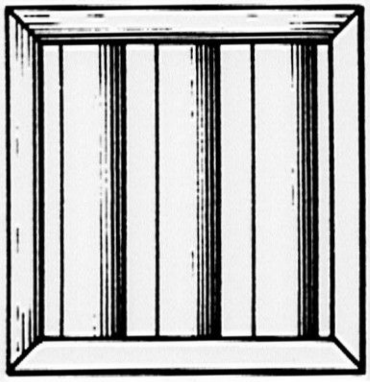


Fig.6

Inventor:
Richard T. Keating
By: Clarence J. Loftus
Attorney.

9

EXCERPTS FROM PLAINTIFF'S EXHIBIT NO. 1 FILED OCTOBER 26, 1956.

Application for United States Letters Patent.

This invention relates to deep fryers of the gas heated or oil heated types, and is specifically directed to improvements in the design and proportions of the frying vessel and its combustion chambers, to bring about quick heating of the frying fat.

It has long been the practice to provide the pot or cooking vessel of commercial deep fryers with one or more horizontal combustion tubes extending transversely through the vessel above the bottom thereof, so that the upper portion of the cooking fat in the vessel may be maintained at a temperature high enough for quick frying of foods immersed therein, yet so that any crumbs, food particles, etc., that may become dislodged from the food in the fryer basket will settle into the lower portion of the vessel below the heating tubes, where the fat is maintained at a temperature low enough so that foods accumulating therein do not burn, char or otherwise discolor or contaminate the fat, nor adversely affect the taste of foods cooked therein.

Many efforts have been made to reduce the heating time required for fryers of this type, since the advantages of fast initial heating and quick heat recovery have long been recognized. In fact, it is universally recognized that the productive capacity of a fryer is limited by its heating efficiency almost as much as by its size, since a fryer is capable of cooking at normal speed only if it is operated at optimum temperature, and any delay in recovering proper frying temperature after food is introduced into the fat is so much time lost. Also, it is obvious that a fryer capable of being rapidly brought to frying temperature in the first instance is much more convenient to use, as well as of greater capacity.

It is therefore the primary object of the invention to provide a deep fryer of the combustion tube type, having its tubes so designed, arranged and dimensionally related to the cooking vessel in which they are positioned that the fryer is capable of heating much more rapidly than are conventional types.

It has heretofore been commonly accepted theory in this art that the heating rate of a given fryer is primarily dependent on the surface area of the combustion tubes employed therein. It has therefore been the accepted practice through the art to direct any efforts toward increasing the heating rate of these fryers to means for increasing the effective heating surfaces. Often this has been done by the provision of fins, flanges, auxiliary tubes, etc., which provide increased surface area within the limited space of the cooking vessel.

The present applicant has made extensive tests and observations of fryers of this type, and has concluded that, contrary to general opinion, the heating efficiency of a deep fryer is largely dependent upon the volumetric capacity of the combustion tubes, rather than upon their surface area. This may be demonstrated by comparison of a number of examples of fryers employing different arrangements of combustion tubes, as follows:

Example I.

In this form of fryer, shown in end elevation in Figure 1 of the drawings of this specification, a 14″ x 14″ cooking vessel is heated by three 2-inch tubes extending longitudinally of the vessel. The area of each of these tubes is 3.14 square inches, and the circumference of each is 6.28 inches. The total area is 9.42 square inches and the total of perimeters is 18.8 inches. The tubes extend the full length of the vessel (14 inches) and it follows that the volumetric capacity of each tube is 43.9 cubic inches, and that each tube has a total surface area of 87.9 square inches. It follows that with this fryer, having a frying surface area of 196 square inches, the total volumetric capacity of the combustion tubes is 132 cubic inches, and the total surface area of the tubes is 264 square inches.

It has been determined by observation of actual tests that with these combustion tubes, the fat in the fryer may be raised from cold solid condition to 375° F. in a time interval of 22 minutes.

Example II.

In this fryer (Figure 2), three tubes of 14-inch length and 3-inch diameter are utilized. The cross sectional area of each tube is 7.07 square inches, and the circumference (perimeter) is 9.42 inches. The total cross sectional area is 21.1 square inches, and the total perimeter is 28.3 inches. The volume of one tube is 98.8 cubic inches, and the total volume is 296 cubic inches. The surface area of each tube is 132 square inches, and the total surface area of all tubes is 396 square inches. This example shows a marked improvement in heating time over Example I and may be raised from cold to 375° F. in 16 minutes.

Example III.

In this example (Figure 3), four oval tubes are employed. These are each 4 inches in height and 2 inches in width, extending the full length of the vessel (14 inches). The area of each tube is 7.14 square inches, and the perimeter of each is 10.3 inches. Thus the total area of the four tubes is 28.6 square inches, and the total perimeter 41.2 inches. The volume of each tube is 100 cubic inches, making a total volume of 400 cubic inches. The total surface area of each tube is 144 square inches, making a total of 576 square inches for all of the tubes. This construction has shown itself to be capable of heating in 10.5 minutes, although it did not afford proper combustion, and in order to operate the unit without objectionable production of carbon monoxide, it was found necessary to reduce the heat input to a point where it required 19 minutes for bringing to full heat.

Example IV.

This example, shown in Figure 4, uses eight oval tubes each 3½-inches in height and 1½-inches in width. The cross sectional area of each tube is 3.27 square inches, making a total of 26.3 square inches. The perimeter of each tube is 8.14 inches, or a total of 65.1 inches. The volume of each tube is 46 cubic inches, making a total of 368 cubic inches. The heating surface of each tube is 114 square inches, making a total of 912 square inches of heating surface. It is to be noted that this surface area greatly exceeds the total surface area presented by the tubes of Example III, yet notwithstanding this fact, it required 14 minutes heating time. In this connection, it is significant to note that the total volume of the tubes is slightly less than the volume of the tubes in Example III.

Example V.

An analysis of the previous examples indicates the desirability of a fryer having an increased volumetric capacity in the tubes. The tubes of this example, illustrated in end elevation in Figure 5 of the drawings and in plan in Figure 6, represent the most successful commercial embodiment of the present teachings. In this example, three tubes are employed, each 14 inches in length and of oval shape, 5 inches high and 3 inches wide. The cross sectional area of each tube is 13.1 square inches, and the total cross sectional area is 39.3 square inches. The perimeter of each tube is 13.4 inches, and the total perimeters, 40.2 inches. The volume of each tube is 183 cubic inches, and the total volume is 549 cubic inches. The total surface area of each tube is 188 square inches, and the total area is 563 square inches.

It has been found that a fryer constructed in accordance with this example is capable of heating from cold to 375° F. in 7.5 minutes. This is almost three times (293%) as fast as the fryer of Example I, and is an improvement of 140% over Example IV, notwithstanding that the tubes of this example have less than two-thirds of its surface area.

These figures demonstrate that the heating capacity of a deep fryer is by no means solely dependent on the surface area of the heating tubes employed, as heretofore supposed. On the contrary, it appears that heating speed is governed to a far greater extent by the volumetric capacity of the combustion chambers within the tubes than by their surface area. The applicant has also observed that the volumetric capacity of the combustion chamber required to adequately heat a given vessel bears a definite relationship to its size, and is more directly related to the cooking area than to the cubic capacity of the vessel. This may be because the amount of cold foods that may be introduced into the fat at any given time is limited by the area of the fryer more than by its depth. In any event, it has been learned that for ideal results there should be about 2.8 cubic inches of combustion space per square inch of area of the cooking vessel. Example V provides this ratio and brings about the fastest cooking rate the applicant has accomplished thus far, although very satisfactory results may be obtained with ratios from 2½:1 to 3:1.

With all of the above, it appears that the necessary volume of the combustion chambers must be achieved without too greatly reducing the surface available for radiation, since there is a point of diminishing returns which may be reached if the surface area is not held in fairly definite proportions to the volumetric capacity of the combustion chambers. There should be about one square inch of tube surface for every cubic inch of combustion space.

From the above and other observations, the applicant has learned that while these ratios should be adhered to quite closely if highest efficiency is to be obtained, yet these relationships must nevertheless be achieved with tubes so shaped and so disposed in the vessel as to permit adequate access for cleaning. In this, the use of tubes of oval cross section is of advantage, and it has been found advisable to mount the oval tubes side by side, and in upright position. Excellent results have been obtained by the employment of a heater as illustrated in Example V, which employs, in a 14″ x 14″ fryer, three oval tubes, each 3 inches wide and 5 inches high.

Thus, by employing the present teachings, it is entirely feasible to provide a commercially successful deep fryer which is so designed that crumbs or food particles may settle and accumulate in the comparatively cold part of the cooking fat, although the upper portions of the fat are heated so efficiently that they may be brought to frying temperature quickly in the first instance and recover their temperature rapidly after the immersion of foods in the fat. The heating time required by the teaching of Example V herein is more than three times as fast as that of Example I, which is itself equal or superior to many conventional deep fryers in this respect, and is significantly faster than can be accomplished by any other arrangement of which applicant is aware. Moreover, this improvement is accomplished by a direct and deliberate departure from teachings heretofore accepted in this industry.

It is accordingly submitted that the applicant, who is the first to propose to design and arrange the combustion tubes of a deep fryer in the manner here disclosed, has made an important contribution to the art, and has commercially practiced his invention by the manufacture and sale of fryers as shown in Example V, yet the invention is of somewhat broader scope and extends to any modification or variation thereof within the appended claims.

Having thus described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes being of oval configuration with their height greater than their width and having internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of the cooking vessel, yet having substantially one square inch of surface area per cubic inch of combustion space.

2. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes being of oval configuration with their height greater than their width and having internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of the cooking vessel.

3. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combus-

tion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes being of oval configuration with their height greater than their width and having internal combustion space with a volumetric capacity of between two and one-half and three cubic inches per square inch of area of the cooking vessel, yet having substantially one square inch of surface area per cubic inch of combustion space.

4. A deep fryer comprising, in combustion, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes being of oval configuration with their height greater than their width and having internal combustion space with a volumetric capacity of between two and one-half and three cubic inches per square inch of area of the cooking vessel.

5. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes having internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of the cooking vessel, yet having substantially one square inch of surface area per cubic inch of combustion space.

6. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes having internal combustion space with a volumetric capacity of substantially 2.8

cubic inches per square inch of area of the cooking vessel.

7. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes having internal combustion space with a volumetric capacity of between two and one-half and three cubic inches per square inch of area of the cooking vessel, yet having substantially one square inch of surface area per cubic inch of combustion space.

8. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes having internal combustion space with a volumetric capacity of between two and one-half and three cubic inches per square inch of area of the cooking vessel.

Paper No. 3.

DEPARTMENT OF COMMERCE
United States Patent Office
Washington

Mailed October 2, 1951

Please find below a communication from the Examiner in charge of this application.

John A. Marzall,
Commissioner of Patents.

Stamp Mailed October 2, 1951.

Applicant: Richard T. Keating
Ser. No. 197,035
Filed Nov. 22, 1950
For Deep Fryer

Clarence J. Loftus
135 S. La Salle St.,
Chicago 3, Ill.

This application has been examined.

References made of record:

Pitman	1,630,309	May 31, 1927	126-391 xr
Childs	2,176,869	Oct. 24, 1939	126-391
O'Dowd	2,182,735	Dec. 5, 1939	126-391
Kells	2,429,360	Oct. 21, 1947	126-391

Upon allowance of any claim, revision as to form may be required in accordance with Order 5267.

Figures 1 to 4 and Examples I to V should be removed from the drawing, as the drawing must be confined exclusively to the invention being claimed. Illustrations of any other devices or any explanatory material considered necessary for a complete understanding of applicant's invention may be presented for the record, but should not be made a part of the official drawing.

Claims 1 to 8 are rejected as unpatentable over Kells. The critical nature of the particular proportions defined is not seen. Applicant has merely conducted experiments to determine what arrangement of Kells' apparatus will give the best results. As stated in Ex parte Appeal No. 48,900 March 29, 1944 (Case No. 131), 26, J.P.O.S. 499, difference in structure must be more than a mere matter of adjustment of size of parts. A mere determination of proper size and proportioning of structures that are well known "falls merely in the category of being routine machine designing" and does not constitute invention. Only the expected and obvious results are seen as being obtained from forming the apparatus in the particular proportions defined. Said proportions are therefore deemed patentably immaterial.

Note the other references made of record.

Examiner.

IN THE UNITED STATES PATENT OFFICE

Division 19.

In re application of
Richard T. Keating
Ser. No. 197,035
Filed November 22, 1950
For—Deep Fryer

RESPONSE.

Honorable Commissioner of Patents
Washington 25, D. C.

Sir:

The following communication is in response to the Office action of October 2, 1951.

Any appropriate changes which may be required in the drawings will be made in due course, but it is requested that such requirements be deferred for the present, since the present drawing will be much more useful in the discussion of the merits of the claims than one conveying less information than now present.

The cited art does not meet any claim of this application. The claims should therefore be allowed, in the absence of some very definite showing of noninvention.

It has been assumed by the Examiner that only the expected and obvious results are obtained. But this is only an unsupported assumption, not a fact. The facts are exactly contrary. Counsel for applicant wishes to bring the point to issue very clearly, since it may be by far the most important matter to be discussed.

In the prior art, much thought, research, and study have been directed to the problems involved here.

Nevertheless, it has been quite generally supposed that the most important single factor affecting efficiency of heating in a deep fryer was the extensiveness of the heating surfaces employed, and that any deep fryer should have as much surface area of heating tubes as practicable. Thus, by application of prior art principles, it would appear to be obvious that a fryer such as shown in Applicant's Figure 4 (which has 912 sq. in. of heating surface) would heat faster than the structure of Figure 5, which has only 563 sq. in.

But the exact opposite is true!

In short, by *directly departing* from prior art principles, applicant has accomplished an improvement of 140%!

On review of the art, we fail to find any inkling that such a result would be "expected" or that it would be "obvious". If we have overlooked anything in the art which has a bearing on this, it will be helpful if the pertinent page and line may be cited, so that adequate response may be made, but in the absence of some showing that the results forthcoming from applicant's new concept are obvious in fact, it is urged that the claims should be allowed.

It is noted that the Kells reference cited has claims to particular proportions which may have been considered to bring about unobvious results, and that the appeal 48,900 does not condemn any case in which invention is present.

Respectfully submitted,

/s/ Clarence J. Loftus,
Attorney for Applicant.

Chicago, Illinois,
March 14, 1952.

Paper No. 5
Mailed July 31, 1952

DEPARTMENT OF COMMERCE
United States Patent Office
Washington

Please find below a communication from the Examiner in charge of this application.

John A. Marzall,
Commissioner of Patents.

Applicant: Richard T. Keating
Ser. No. 197,035
Filed November 22, 1950
For Deep Fryer

Clarence J. Loftus
135 S. La Salle St.,
Chicago 3, Illinois

Responsive to letter filed March 15, 1952.
Claims 1 to 8 remain in this application.
Postponement of the drawing corrections is noted.

Claims 1 to 8 are rejected as unpatentable over Kells in view of O'Dowd. The critical nature of the particular proportions defined is not seen nor has same been satisfactorily explained. Applicant is held to have merely conducted tests or experiments to determine what arrangement of the prior art structures, or of certain other conventional designs of the common deep fryer, will give the best results. As stated in Ex parte Appeal No. 48,900 March 29, 1944 (Case No. 131), 26 J. P. O. S. 499, difference in structure must be more than a mere matter of adjustment of size of parts. A mere determination of proper size and proportioning of structures that are well known "falls merely in the category of being routine machine designing" and does not constitute invention. No new, unexpected or unobvious result is seen as being obtained from forming the apparatus in the particular proportions defined. The conclusions arrived at as a result of applicant's experimentation do not rise to the dignity of invention.

In regard to applicant's remarks, it is apparently applicant's position that the prior art teaches "that any deep fryer should have as much surface area of heating tubes as practicable". Applicant's position is not supported by the prior art. Applicant's attention is directed to lines 27 to 29, column 1, page 2 of O'Dowd wherein it is made clear that the patentee is not only interested in using the proper size and shape for the flues b^5 but also realizes the importance of permitting "the free circulation of the liquid around the flues".

This last factor, namely, the influence of fluid flow rate in an indirect heat exchange, is well recognized in the heat transfer arts. This is necessarily a function of tube spacing, amongst other factors.

This action is made final in accordance with *Ex parte Jackson,* 1926 C. D. 102; 353 O. G. 5.

Examiner.

Paper No. 8.

Department of Commerce
United States Patent Office
Washington

Pat. Div. 19.
Mailed April 30, 1953.

In re application of
Richard T. Keating
Ser. No. 197,035
Filed November 22, 1950
For Deep Fryer

Appeal No. 36,449.
Before the Board of Appeals.

Clarence J. Loftus for Appellant.

EXAMINER'S STATEMENT.

This is an appeal from the final rejection of claims 1 to 8, inclusive.

An accurate copy of the appealed claims appears on pages 11 to 13 of applicant's brief.

The references relied on are:

Kells	2,429,360	Oct. 21, 1947
O'Dowd	2,182,735	Dec. 5, 1939

Description of the invention:

The device claimed consists simply of an open top cooking vessel adapted to contain fat to be heated so as to deep fry food immersed therein, with a plurality of horizontal combustion tubes extending transversely through the interior of said vessel from one side to the side opposite thereof, said tubes being spaced substantially above the bottom and below the top of said vessel, the ratio between the volumetric capacity of said tubes and the surface area of the cooking vessel being defined between predetermined limits. Also, some of the claims being appealed define a second ratio. Said second ratio being a substantial constant between said volumetric capacity of said tubes and the surface area of said tubes. The limits of the first mentioned ratio are between two and one-half and three to one and the second ratio is substantially one to one. Some of the claims being appealed define the tubes as being of oval configuration with their height greater than their width.

The art:

Kells shows an open top cooking vessel or receptacle 20 adapted to contain fat to be heated so as to deep fry food immersed therein, with a plurality of horizontal combustion tubes 23 extending transversely through the interior of said vessel 20 from one side to the side opposite thereof, said tubes being spaced substantially above the bottom and below the top of said vessel. Kells shows various forms of said tubes, including tubes of oval construction with their height greater than their width. Note especially, Figure 9 of Kells. A burner is positioned adjacent the inlet end of said tubes 23 to direct combustion into the tubes.

O'Dowd also shows an open top cooking vessel B adapted to contain fat to be heated so as to deep fry food immersed therein, with a plurality of horizontal combustion tubes b^5 extending transversely through the interior of said vessel B from one side to the side opposite thereof, said tubes being spaced substantially above the bottom and below the top of said vessel and being of oval construction with their height greater than their width. A burner E is positioned adjacent the inlet end of said tubes b^5 to direct combustion in the tubes.

The rejection and response to
applicant's remarks:

The issue in this matter appears to resolve simply into the question of whether or not the precise proportions or ratios of the parts set forth in the claims are critical and if they are critical and produce a new and useful result, do they obtain an unexpected or unobvious result.

It is the position of the Examiner that said proportions or ratios are neither critical nor do they obtain any unexpected or unobvious result.

It is considered obvious that all of the claims under appeal, except for the specific proportions or ratios defined, read directly on both Kell's and O'Dowd's construction. The grounds of rejection of claims 1 to 8 as unpatentable over Kells in view of O'Dowd are set forth in paper No. 5. In addition to the remarks contained therein, attention is invited to the fact that certain of the limitations alleged to be critical are omitted from some of the claims. For example, note that the limitation "yet having substantially one square inch of surface area per cubic inch of combustion space", recited in the last few lines of claims 1, 3, 5, and 7, is omitted from claims 2, 4, 6, and 8. The comparatively recent case, *In re Ripper* (CCPA) 80 U. S. P. Q. 96; 619 O. G. 855 held that a limitation in a claim cannot be considered critical when it is omitted from other claims. It is therefore apparent that the above quoted limitation is not critical.

In another comparatively recent decision, *In re Renstrom* (C. C. P. A.) 81 U. S. P. Q. 390, 624 O. G. 5 it is stated that "Where a small structural difference is involved and where there is no apparent reason why such difference should produce a great improvement, the burden is upon the applicant to show, by factual evidence, that he has obtained an unexpectedly good result". In the instant case the specific proportions recited in the claims constitute only a minor variation, if any, from the construction of either Kells or O'Dowd and it is not at all apparent why such variation should produce a great or unexpected result. In an oral interview this was related to applicant and it was suggested by the Examiner that proof of the alleged unexpected results be submitted for consideration, either by affidavit or by demonstration. This suggestion was never followed.

In the second paragraph on page 5 of Applicant's Brief it is stated that "applicant, in his specification, * * * has given performance figures substantiating this proposition". It is to be noted that nowhere in the specification does applicant state that the same burner heat input is being supplied to the combustion tubes in each of the five "Examples" or tests described. No burner is even either described or illustrated by applicant. It is also not clear from a study of the results of said "Examples" or tests why it is concluded that "there should be about 2.8 cubic inches of combustion space per square inch of area of the cooking vessel". It is noted from said "Examples" that the cooking time decreased substantially proportionally with an increase in the total volume of the tubes. Would a further increase in the volume or in the ratio of the cubic inches of the combustion space per square inch of area of the cooking vessel further decrease the cooking time? An answer for this question is not found either in the specification or in Applicant's Brief. In addition, it is not clear just how much of the improved results are due to other important factors, such as tube spacing, tube arrangement, tube shape, the number of tubes, material and construction of the tubes, and the depth of tube immersion in the fat in the fryer. Applicant does not explain what effect variations in some or all of these factors would have on the ratios defined in the claims. It is manifest therefore that in the absence of acceptable proof of successful operation with any open top cooking vessel having a plurality of oval horizontal combustion tubes extending transversely therein, the effect, criticality and value of the ratio's claimed is in doubt. This being so and there being no unexpectedly good result, the principle of law expounded in the case of *In re Williams,* 1930 C. D. 97; 392 O. G. 737; 36 F. (2d) 436, applies. In said case it was stated: ''There is no invention in changing the size and proportion of a device or machine as long as the construction and mode of operation remain the same. It is a settled principle of law that a mere carrying forward of an original patented conception involving only change of form, proportions or degree, or in the substitution of equivalents doing the same thing as the original invention, by substantially the same means, is not such an invention as will sustain a patent, even though the changes of the kind may produce better results than prior inventions''.

In conclusion, it should be noted that Kells was equally interested in ''achieving a low heating load per unit area'', in the ''recovery speed of a fryer'' and in better efficiencies. In solving these problems Kells considered not only certain ratios, as the ''ratio of length of tube to cross-sectional area'', but the heat input, the ''shape and dimension of the heat exchange tubes'', tube displacement, fryer dimensions, tube heating surface, effect of the ''wiping action of the tube surfaces by the liquid to favor rapid heat transference'', and many other factors. To hold that applicant has so improved upon Kells' teachings to entitle him to a letters patent of equal dignity without applicant having satisfactorily shown equal consideration of many of these other factors and to have truly attained an unexpected result is deemed improper.

Affirmance is requested.

Examiner Division 19.

Clarence J. Loftus,
135 So. La Salle Street,
Chicago 3, Illinois.

IN THE UNITED STATES PATENT OFFICE.

Appeal No. 36,449.

In re application of Richard T. Keating Serial No. 197,035 Filed November 22, 1950	For Deep Fryer

MEMORANDUM.

Honorable Commissioner of Patents,
Washington 25, D. C.

Sir:

The following points will be discussed as fully as time permits at the hearing on February 3, 1954, but it is requested that this memorandum be entered in the Patent Office files to keep the written record as complete as possible.

1. Applicant's invention is a real advance in the art. It is *actual,* not theoretical.

Never during the prosecution of this application has the Examiner challenged the fact that applicant *actually achieves* radically improved results. Rather, the rejection has been that no invention was involved, despite the terrific gains accomplished.

The Examiner's statement for the first time mentions "the absence of acceptable proof of successful operation" (Page 5). This is thought to imply doubt that applicant's fryer can in fact accomplish the results claimed for it, and applicant accordingly requests consideration of proofs of actual accomplishment, under Rule 195. These have not been presented earlier because actual accomplishment of the increased heating speed claimed by applicant was not challenged earlier. The additional showing to be submitted herewith includes:

> (a) Affidavit of Mr. Keating showing 7.5 minute preheating time.
>
> (b) Corroborating affidavit of a user of the Keating fryers.
>
> (c) Copy of pages of American Gas Association Laboratories Approved Appliances Directory showing the Keating machine to have the highest BTU rating of any deep fat fryer, and a rating 1.71 above the next best internally heated tubular fryer of the same size; and
>
> (d) Copy of Commercial Current Events, published by the Hotpoint Company (a competing manufacturer of *electric* deep fryers), deriding all gas appliances and the Keating fryer in particular, yet pointing out that "The present A. G. A. approved (Keating) model has a recovery rate 1.73 times that of the next best gas kettle tested by the Hotpoint engineers."

2. This abrupt and dramatic advance is neither obvious, nor is it to be expected from mere redesign of the prior art. The art is old, active and extremely competitive. Competing manufacturers have for years vied with

each other in exerting their best effort to increase the heating speed of their equipment. They have designed, redesigned, and designed again. Under these circumstances, any deviations from the most advanced developments of the prior art would be expected to result in *lowering* the speed rather than improving it. Had there been *any* obvious way to almost double the heating speed of this type of equipment, the sharp eyes of other workers in the art would have seen it years ago.

3. The Keating disclosure is in full compliance with the Patent Office Rules of Practice, and with the applicable statutes. It is completely in accord with the provisions of 35 U. S. C. 112, which require that the specification be

> "in such full, clear, concise, and exact terms as to enable any person skilled in the art or science to which the invention or discovery appertains, or with

which it is most nearly connected, to make and use the same." The principle of law set out in *In re Renstrom,* 81 USPQ 390, is inapplicable to the present case, because the Court in that case dealt with "general statements as to alleged advantages, not being based on actual comparative tests," while in the present case the results given in the original sworn specification are *based on actual tests* and are so stated.

4. The criticism that applicant did not state his gains to be accomplished with "the same burner heat input", and the many implications in the Examiner's Statement that he did not show "equal consideration of many of these other factors" are not properly taken. To begin with, let the record be clear that the new results are *not* accomplished by the same input. On the contrary, it is applicant's invention which first makes a higher BTU capacity *possible.* The simple fact is that fryers of the prior art were incapable of handling anything like the present BTU input. And, as is well known, arbitrary

increase of gas input results in production of dangerous carbon monoxide.

The applicant's contribution to the art is a radical advance in heating speed. He has never contended that this was accomplished without burning some additional fuel. This accounts for the fact that applicant's device has an A. G. A. rating of 72,000 BTU as against 42,000 for the next best. As to the "other factors", we need only say that the rigid standards of the American Standards Association create a situation wherein a commercial manufacturer is not apt to gain A. G. A. approval of his equipment if any important considerations are overlooked. The mere fact that applicant has limited his discussion primarily to his deviations from the conventional practices of the art should not react to his disadvantage. It is in accordance with the spirit of Patent Office Rules of Practice that the description be directed primarily toward the *novel* features of the disclosure.

5. The case of *In re Ripper,* 80 USPQ 96, is not in point. The claim limitation under discussion there was critical in that it was the *only* limitation distinguishing from the art. The case at hand is different. The question here is only whether the secondary proportions defined in some of the claims contribute to the beneficial results obtained. Whether these proportions are critical or not may be determined only by actual performance of the equipment, and may be discerned only by actual test. If a specific proportion has shown itself to bring about a better result than some other, it is a contributing factor to the success of the invention. Such is the case here.

Respectfully submitted,

/s/ L. F. Hammand,
Attorney for Applicant.

Chicago, Illinois,
January 29, 1954.

In the United States Patent Office

Appeal No. 36,449

In re application of
Richard T. Keating
Serial No. 197,035
Filed November 22, 1950 } For—Deep Fryer

AFFIDAVIT.

State of Illinois,
County of Cook. } ss.

Richard T. Keating, being duly sworn, deposes and says as follows:

1. That he is president of Specialties Appliance Corporation, 1220 West Van Buren Street, Chicago 7, Illinois.

2. That he is the inventor of the deep fryer disclosed in application Serial No. 197,035, and that the performance figures of the five examples of fryers set out therein are from actual tests conducted under his supervision.

3. That for several years since his invention of the deep fryer disclosed in his patent application Serial No. 197,035, the Specialties Appliance Corporation has manufactured and marketed deep fryers in accordance with Example V of his specification, and has identified such deep fryers as Keating Model A-14.

4. That said Keating Model A-14 fryers have been approved by the American Gas Association Laboratories according to standards of the American Standards Association with a rating of 72,000 BTU per hour, and that this rating is the highest rating of any deep fat fryer listed in the Directory of Approved Appliances published by

the American Gas Association Laboratories for January, 1953. Affiant further states that he is familiar with the construction of the several deep fat fryers listed on pages 313 and 314 of said Directory, and that the next highest rating for an internally heated tubular type fryer of comparable size (14″ x 14″) is only 42,000 BTU per hour.

5. Affiant further states that he has observed the operation and use of these Keating Model A-14 fryers in various installations, and that under conditions of actual practical operation as approved by the American Standards Association and American Gas Association Laboratories, the fryers are capable of heating from a room temperature of approximately 75° F. to a cooking temperature of 375° F. in 7.5 minutes.

/s/ Richard T. Keating.
Richard T. Keating.

Subscribed and sworn to before me this 28th day of January, 1954.

/s/ Eileen A. Anderer,
(Seal) *Notary Public.*

My Commission Expires: 7-1-56.

AFFIDAVIT.

State of Illinois, } ss.
County of Cook. }

F. Koller Elliott, being duly sworn, deposes and says that he is familiar with the Keating Model A-14 deep fat fryer as manufactured by the Specialties Appliance Corporation of Chicago, and that he has repeatedly observed the operation of this fryer in his place of business at 534 West Garfield Blvd., Chicago, Ill., and that he has personally observed that the Keating A-14 fryer is capable of preheating from room temperature of approximately 75° F. to cooking temperature in 7.5 minutes.

/s/ F. Koller Elliott.
F. Koller Elliott.

Subscribed and sworn to before me this 29th day of January, 1954.

/s/ Rose Gustafson,
(Seal) *Notary Public.*

My Commission Expires: 9-30-56.

AFFIDAVIT.

State of Illinois, } ss.
County of Cook. }

Frank A. Martin, being duly sworn, deposes and says that he is familiar with the Keating Model A-14 deep fat fryer as manufactured by the Specialties Appliance Corporation of Chicago, and that he has repeatedly observed the operation of this fryer in his place of business at 2614 Greenbay Road, Evanston, Illinois, and that he has personally observed that the Keating A-14 fryer is capable of preheating from room temperature of approximately 75° F. to cooking temperature in 7.5 minutes.

/s/ Frank A. Martin.
Frank A. Martin.

Subscribed and sworn to before me this 29th day of January, 1954.

/s/ Rose Gustafson,
(Seal) *Notary Public.*

My Commission Expires: 9-30-56.

Paper No. 14

(Stamp) U. S. Patent Office Board of Appeals Mar 30 1954 mailed.

Appeal No. 364-49
Hearing:
February 3, 1954

In the United States Patent Office

Before the Board of Appeals

Ex Parte Richard T. Keating.

Application for Patent filed November 22, 1950, Serial No. 197,035. Deep Fryer.

Lowell F. Hammand for appellant.

This is an appeal from the final rejection of claims 1 to 8, inclusive. No claims have been allowed by the Examiner.

The following claims are representative:

> 1. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes being of oval configuration with their height greater than their width and having internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of the cooking vessel, yet hav-

ing substantially one square inch of surface area per cubic inch of combustion space.

2. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes being of oval configuration with their hight greater than their width and having internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of the cooking vessel.

4. A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes being of oval configuration with their height greater than their width and having internal combustion space with a volumetric capacity of between two and one-half and three cubic inches per square inch of area of the cooking vessel.

The references relied on are:

O'Dowd	2,182,735	Dec. 5, 1939
Kells	2,429,360	Oct. 21, 1947

The appealed claims relate to a deep fat fryer of the gas-heated type having combustion flues extending transversely through the vessel intermediate the top and bottom, the flues being oval in cross section with their height greater than their width. Deep fryers of this type are admitted by appellant to be well known and are shown in the patents to Kells and O'Dowd listed above. The feature of appellant's fryer which he contends to be patentably novel is the relationship of the volume of the combustion flues to their surface area and to the horizontal cross-sectional area of the top of the cooking vessel which appellant refers to as the "cooking area." The specific proportions of the parts of appellant's fryer will be apparent from a reading of the representative claims reproduced above. Appellant states that the purpose of his design is not to achieve economy of fuel consumption but is to make possible the maximum BTU input consonant with complete combustion with the objective of obtaining a quick heating of the fat.

Claims 1 to 8, inclusive, stand rejected as unpatentable over Kells in view of O'Dowd. Both of these references show deep fryers having oval combustion tubes extending transversely of the fryer vat intermediate the top and bottom. The tubes are disposed with their major transverse dimension upright as in appellant's device. As stated by the Examiner, the issue is simply whether the particular dimensional relationships recited in the claims are critical and produce a new, useful and unexpected or unobvious result. Since the filing of the brief, affidavits have been submitted executed by appellant and by two other persons which indicate that appellant's deep fryer has a relatively rapid heating rate as compared with certain other fryers listed in a report of the American Gas Association. Appellant's affidavit also indicates that the BTU input of his device is relatively high as compared with various other gas-fired deep fryers. These affidavits, while not showing a comparison with the Kells and O'Dowd devices, are considered by us to show that appellant's design is capable of relatively rapid heating which is a fact that has not been disputed by the Examiner. The issue, therefore, resolves itself to the question of whether the result obtained differs from that obtained by the reference devices in an unexpected or unobvious degree and whether the dimensions stated in the claims are critical. The Examiner's view is that appellant has merely conducted routine experiments with various dimensions to find the combination of dimensions which will give the optimum results and it is his holding that the dimensions recited in the claims are the result of mere engineering design and not inventive ingenuity.

Appellant contends that the superiority in heating speed of his fryer, as compared with other fryers of the gas-fired type now on the market, is of such magnitude as to constitute a difference in kind and not a mere difference in

degree as the Examiner has held. He argues that the prior art workers thought that the way to increase the heating rate of fryers was to increase the effective heating surface of the combustion tubes, whereas he has found out after extensive tests that the heating efficiency of a deep fryer is largely dependent upon the volumetric capacity of the combustion tubes rather than upon their surface area. He points out in the first paragraph on page 6 of his specification, however, that the volume of the combustion chambers must not be extended to the point where the surface available for conduction of heat to the fat is proportionately too small since there is a point of diminishing return which is reached if the surface area is not held in fairly definite proportion to the volumetric capacity of the combustion tubes. He contends that he has discovered an unobvious fact in finding out that the volumetric capacity of the combustion tubes required to adequately heat a given vessel is more directly related to the cooking area than the cubic capacity of the vessel because the amount of cold food that may be introduced into the vat at a given time is limited by the area of the fryer more than by its depth.

We have carefully considered all of appellant's contentions and arguments as well as the affidavits referred to above but we are unable to see that appellant has exercised more than judicious mechanical design in proportioning the tubes of the prior art references in the specific manner claimed. It seems that if economy of fuel is no desideratum and rapid heating is the principal objective, it would be obvious to any engineer that the more fuel that can be completely burned per hour the more heat will be generated. In order to burn greater quantities of gas completely without a carbon monoxide residue, it

is obvious that a larger space must be provided within which the increased quantities of fuel can be burned. As appellant points out on page 6 of his specification, there is a limit to which the cubic volume of the combustion chamber can be increased relative to the heat exchange surface beyond which the burning of more fuel will not produce a corresponding increase in the heat transfer to the fat. It may be that this limit of cubic capacity relative to surface area is the optimum condition for fast heating but we are unable to see that it involves any unobvious principle of thermo-dynamics and it is a value which can be determined by mere routine tests. Similarly, it seems obvious to us that as the area of the cooking vessel is increased there is made available greater space for the introduction of more cold food and if a maximum recovery rate is desired the cooking area cannot be too great relative to the cubic volume of the combustion space. Here again there is no obscure or unobvious principle involved and the optimum value is easily determinable by mere routine tests. It seems to us that in the design of a deep fryer that is to have a fast recovery rate there are several variables involved and the claimed proportions are merely the result of the routine tests necessary to determine the optimum relationship.

We have considered the authorities cited by appellant in support of his position but we think the instant situation is one more properly governed by the statement of law in the case of *In re* Williams, 1930 C. D. 97; 36 F. (2d) 436; 392 O. G. 737 relied upon by the Examiner where the court said:

> "It is a settled principle of law that a mere carrying forward of an original patented conception involving only change of form, proportions or degree, or the substitution of equivalents doing the same thing as the original invention, by substantially the same means, is not such an invention as will sustain a patent, even though the changes of the kind may produce better results than prior inventions."

That appellant has produced a deep fryer which is superior in the capability of fast heating to some other fryers listed in the American Gas Association report, none of which is identified as being the Kells or O'Dowd fryer, is doubtless true but even if the other fryers were identified as being the fryers of the cited references mere improvement without invention is not patentable. The question is, did appellant's particular proportioning of the parts of the Kells or O'Dowd fryers constitute a creation which required invention as distinct from mechanical skill. We think it did not. The rejection of claims 1 to 8, inclusive, is sustained.

The decision of the Examiner is affirmed.

Mark Taylor,
Examiner-in-Chief,
M. H. Friedman,
Examiner-in-Chief,
(Acting)
P. T. Dracopoulos,
Examiner-in-Chief,
(Acting)
Board of Appeals

March 30, 1954.

Lowell F. Hammand,
135 S. La Salle St.,
Chicago 3, Ill.

PLAINTIFF'S EXHIBIT NO. 2.

Fig. 1

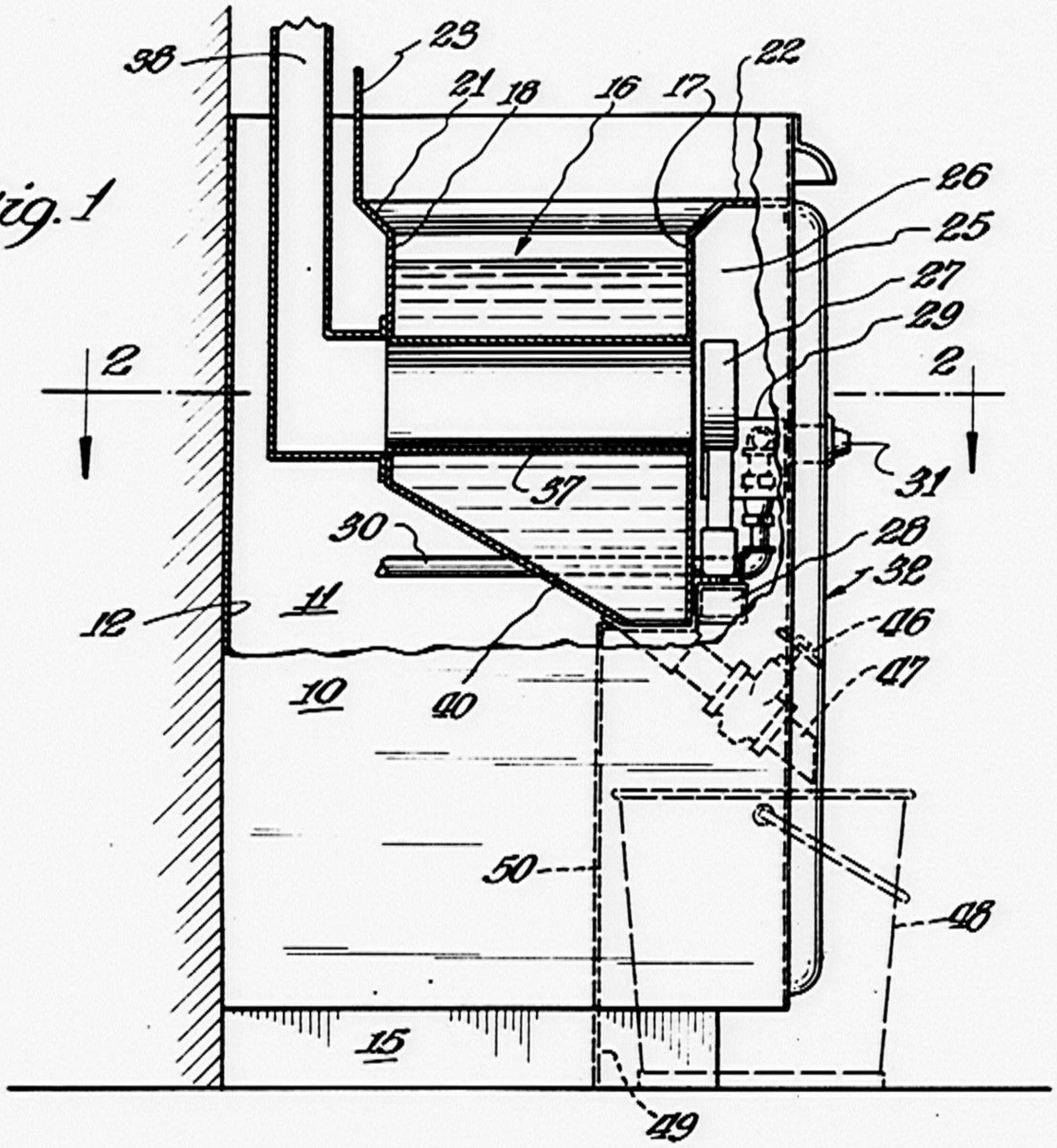
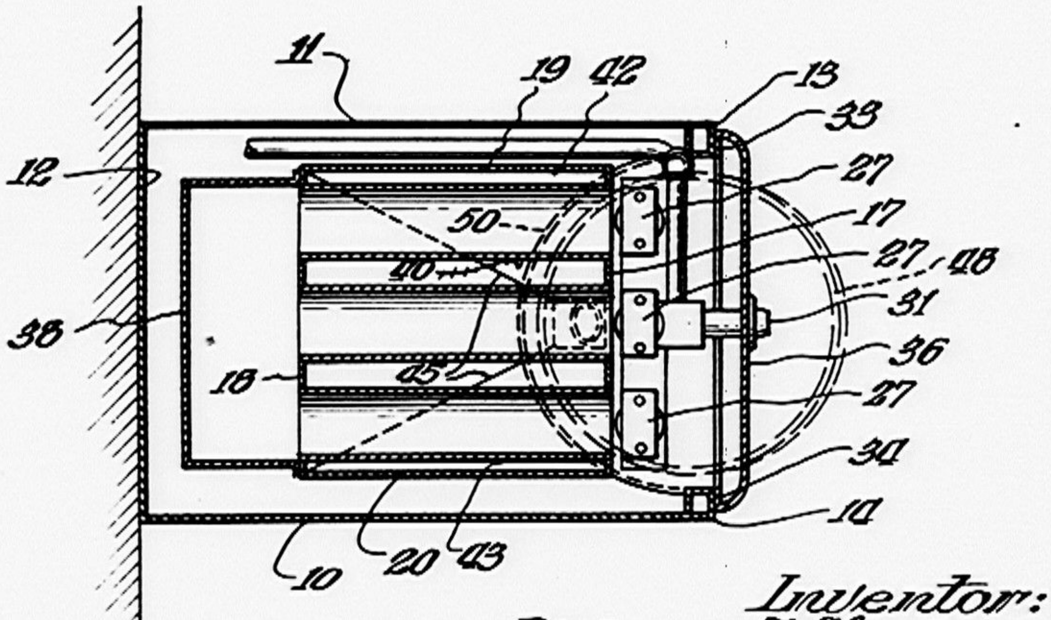


Fig. 2



Inventor:
Richard T. Keating.
By:

Attorney.

EXCERPTS FROM PLAINTIFF'S EXHIBIT NO. 2 FILED OCTOBER 26, 1956.

Application For United States Letters Patent.

This invention relates to deep fryers, and has particular reference to a novel and improved deep fryer wherein the several component parts of the fryer are so arranged as to provide unobstructed access to the frying vessel for the drainage thereof, yet to accomplish this aim without adversely affecting the placement of the heating tubes, burners, controls, and other operating instrumentalities with which fryers of this general type are ordinarily equipped.

In deep fryers of conventional construction, the rather exacting requirements as to size, location and arrangement of the combustion tubes, burners, and controls therefor dictate a general arrangement of parts which is inherently conflicting with the requirements for adequate and convenient drainage of the cooking vessel. It follows that the waste grease or frying fat from the frying vessel of a conventional fryer can be drained only with considerable difficulty, often involving danger of spilling or scalding the operator with hot grease.

It is therefore the primary object of the present invention to provide a deep fryer of unique design and construction whereby these conflicting requirements are reconciled, and to provide a structure wherein the several essential parts of the frying vessel and its housing are so grouped and so spaced in relationship to each other as to provide adequate facilities for conveniently draining the frying vessel, while at the same time maintaining the vessel, the housing, burners, manifolds, combustion tubes, operating controls, and other related parts in position for efficient functioning.

It is a further object of the invention to provide a fryer wherein the burners, manifolds, manually adjustable control valve and correlated parts of the heating system are conveniently positioned at the front of the unit, yet the drain valve and its spout are located adjacent the front edge of the fryer housing and well above the base thereof, with the base recessed to permit a pail or other portable container to be placed on the floor and partially within the fryer housing as the fat is drained from the frying vessel.

A further object of the invention is to provide a fryer having a drain valve and spout extending forwardly from the frying vessel and located immediately within the front door of the fryer housing where the valve is in a position for easy access and convenient manipulation, and where the spout is so positioned as to be visible under all circumstances, so that both the spout and the portable container into which it discharges the frying fat may be continuously observed as the draining proceeds, whereby danger of accidental overflow of the grease pail is largely eliminated and so that filtering of the fat may be done as the draining proceeds, if desired.

These objects are accomplished according to the present teaching in a deep fryer of the type wherein the frying vessel is mounted on and supported by an open front housing, with the frying vessel spaced away from the front of the housing to provide an adequate burner compartment therebetween, and with the front of the housing closed by a fryer door so that the burners and other operating mechanisms of the heating system of the fryer are concealed and protected against dirt and dust.

According to the present invention, the bottom of the frying vessel is formed of three panels inclined downwardly from the rear of the vessel to the front thereof, and also inclined inwardly from the sides, so that the lowermost point of the vessel is at the center of the forward edge thereof and at a point sufficiently below the combustion tubes of the fryer as to provide adequate space for the gas manifolds, mixing chambers, and control devices above the lowermost point on the frying vessel. A drain valve and spout are angularly affixed to the vessel at this point, so that while they extend angularly downwardly and forwardly to a point actually beyond the front edge of the fryer housing, they are nevertheless sufficiently below the burners as to cause no interference therewith, yet are well above the base of the fryer housing. At the same time, the drain valve and spout are concealed and covered by the door which extends substantially the full height of the housing.

A preferred embodiment of the present invention is illustrated in the drawings of this specification, wherein:

Figure 1 is a side elevational view of a deep fryer, shown partially in section; and

Figure 2 is a plan sectional view taken substantially on the plane of the line 2-2 of Figure 1.

The fryer includes an exterior housing shown as consisting of metal side walls 10 and 11, each extending forwardly from the back 12 to the front corner posts 13 and 14 respectively. The housing is mounted on a base 15 and is arranged to support a frying vessel generally designated as 16. The vessel 16 includes vertical front and back walls 17 and 18, with side walls 19 and 20, and as shown, is provided with a tapered upper rim 21 by which it is joined to a flat top plate 22 and a vertical rear plate 23.

The frying vessel 16 is spaced substantially away from the front edge 25 of the housing to provide a sizeable burner compartment 26 between the forward wall 17 of the frying vessel and the front edge of the cabinet. This burner compartment serves to house the gas burners 27, together with their manifold 28 and thermostatically controlled valve 29, to which a gas supply line 30 supplies combustible gas. As illustrated, the valve 29 includes a manually adjustable knob 31 projecting through an aperture provided in the front door 32 of the housing. The door 32 is hinged in place by hinges (not shown), but is formed of embossed or convex shape, so that while its flanges 33 and 34 are flush against the corner posts 13 and 14 defining the front edge 25 of the housing, yet the center portion 36 of the door is spaced somewhat outwardly therefrom.

The cooking vessel 16 has three horizontal combustion tubes 37, each in alignment with one of the burners 27 and extending from the burners through the cooking vessel to a flue 38. The bottom of the frying vessel comprises an inclined panel 40 sloping forwardly from the lower edge of the rear wall 18 to the lower edge of the front wall 17, together with inclined panels 42 and 43 (Figure 2) sloping inwardly from the lower edges of the side walls 19 and 20 and intersecting the panel 40 along the diagonal lines 45.

A drain valve 46 and discharge spout 47 are mounted on the frying vessel at the lower forward corner. These parts are also inclined forwardly and downwardly, with the spout 47 extending somewhat forwardly of the front edge 25 of the housing. In this position, the valve and spout will be enclosed and concealed by the front panel 36 of the housing door 32 when the door is closed, but will be easily accessible and in a position of unimpaired visibility when the door is opened. Thus, in draining the fat from the frying vessel, the operator may place a portable container 48 in such a position that the flow of fat is easily observed and controlled by the valve 46, which is in such a position that the valve may be conveniently adjusted to regulate the rate of flow as the flow progresses.

The base 15 of the housing is recessed at 49 so that when the housing door 32 is opened, the portable container 48 may be moved inwardly as far as desired toward the inner wall 50 of the fryer housing. Thus, in draining the fat from the cooking vessel, the flow may be easily observed and conveniently controlled, and the dangers of accidental overflow are correspondingly reduced. Also, the container 48 is in a position sufficiently accessible so that, if desired, the fat may be filtered as it is drained into the container. These aims are accomplished, moreover, with an overall arrangement of parts whereby both the drain valve and the heating instrumentalities of the fryer are positioned for efficient operation and are readily accessible, yet wherein neither of these parts interferes with the proper and normal functioning of the other. Thus, the disadvantages ordinarily existing in conventional deep fryers are overcome, and the inherently conflicting requirements providing adequate means of heating and drainage are successfully reconciled.

Having thus described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. A deep fryer comprising, in combination, an open front housing, with a frying vessel supported thereon and spaced from the front thereof and a burner compartment between the forward edge of the frying vessel and the front of the housing, said frying vessel having a sloping bottom for the frying vessel extending downwardly and inwardly from each side of the vessel and downwardly and forwardly from the rear edge of the vessel to the forward edge thereof, with a drain valve and spout mounted on the lowermost point of the frying vessel and extending from the forward edge of the vessel downwardly, forwardly and outwardly through the open front of the fryer housing; to-

gether with a convex door on the fryer housing extending around and enclosing said drain valve and spout, with a base for the fryer housing having a recess extending inwardly under the drain valve and spout and adapted to receive a portable container into the open front of the housing.

2. A deep fryer comprising, in combination, an open front housing, with a frying vessel supported thereon and spaced from the front thereof and a burner compartment between the forward edge of the frying vessel and the front of the housing, said frying vessel having a sloping bottom for the frying vessel extending downwardly and inwardly from each side of the vessel and downwardly and forwardly from the rear edge of the vessel to the forward edge thereof, with a drain valve and spout mounted on the lowermost point of the frying vessel and extending from the forward edge of the vessel downwardly, forwardly and outwardly through the open front of the fryer housing; together with a convex door on the fryer housing extending around and enclosing said drain valve and spout.

3. A deep fryer comprising, in combination, an open front housing, with a frying vessel supported thereon and spaced from the front thereof and a burner compartment between the forward edge of the frying vessel and the front of the housing, said frying vessel having a sloping bottom for the frying vessel extending downwardly and inwardly from each side of the vessel and downwardly and forwardly from the rear edge of the vessel to the forward edge thereof, with a drain valve and spout mounted on the lowermost point of the frying vessel and extending from the forward edge of the vessel downwardly, forwardly and outwardly through the open front of the fryer housing.

4. A deep fryer comprising, in combination, and open front housing, with a frying vessel supported thereon;

said frying vessel having a sloping bottom for the frying vessel extending downwardly and inwardly from each side of the vessel and downwardly and forwardly from the rear edge of the vessel to the forward edge thereof, with a drain valve and spout mounted on the lowermost point of the frying vessel and extending from the forward edge of the vessel downwardly, forwardly and outwardly through the open front of the fryer housing; together with a convex door on the fryer housing extending around and enclosing said drain valve and spout, with a base for the fryer housing having a recess extending inwardly under the drain valve and spout and adapted to receive a portable container into the open front of the housing.

5. A deep fryer comprising, in combination, an open front housing, with a frying vessel supported thereon; said frying vessel having a sloping bottom for the frying vessel extending downwardly and inwardly from each side of the vessel and downwardly and forwardly from the rear edge of the vessel to the forward edge thereof, with a drain valve and spout mounted on the lowermost point of the frying vessel and extending from the forward edge of the vessel downwardly, forwardly and outwardly through the open front of the fryer housing; together with a convex door on the fryer housing extending around and enclosing said drain valve and spout.

6. A deep fryer comprising, in combination, an open front housing, with a frying vessel supported thereon; said frying vessel having a sloping bottom for the frying vessel extending downwardly and inwardly from each side of the vessel and downwardly and forwardly from the rear edge of the vessel to the forward edge thereof, with a drain valve and spout mounted on the lowermost point of the frying vessel and extending from the forward edge of the vessel downwardly, forwardly and outwardly through the open front of the fryer housing.

Paper No. 13

DEPARTMENT OF COMMERCE
United States Patent Office
Washington

In re application of Richard T. Keating Ser. No. 197,036 Filed November 22, 1950 For Deep Fryer	Appeal No. 41318 Before the Board of Appeals

(Stamp) Mailed Jun 9 1954 Pat. Div. 58

Lowell F. Hammand for Appellant

EXAMINER'S ANSWER.

This is an appeal from the final rejection of claims 1-6 inclusive.

A correct copy of the appealed claims appears on pages 6-9 inclusive of applicant's brief.

The references of record relied on are:

Swindell	366,701	July 19, 1887
Kells	2,429,360	Oct. 21, 1947
Pappas	2,528,776	Nov. 7, 1950

The invention is adequately described in applicant's brief.

Description of the References.

Patent to Pappas discloses a deep fat frying apparatus enclosed in a cabinet 1 having a door as shown in Figs. 1 and 2. The frying container 2 has symmetrical sloping bottom walls at the lowest point of which is a drain conduit and valve. A drain pan 8 is kept within the space at the bottom of the housing.

Patent to Kells discloses a deep fat fryer in which the receptacle 20 has an inwardly sloping bottom from two sides as in Fig. 2 and also slopes in one direction for the other sides as in Fig. 3.

Patent to Swindell discloses cooking apparatus having a recess formed in the housing to receive a drain receptacle as in Fig. 1.

The Rejection.

Claims 1-6 inclusive stand rejected as defining nothing patentable over patent to Pappas as in Paper #8. Patent to Kells has merely been cited to show an asymmetrical arrangement of the sloping bottom of the frying container. Whether the drain is placed nearer the front end is an obvious matter of choice. Pappas has an extended valve handle which is also readily accessible from the front. Placing the drain conduit and valve at an angle is likewise considered a matter of choice or common plumbing mechanics which cannot be dignified as invention. The convex shape of the door in claim 1 is also a matter of design. The arrangement of Pappas' drain receptacle is the full equivalent of applicant's recess.

Respectfully,

Examiner (Div. 58)

Copy to:
Lowell F. Hammand,
135 S. LaSalle St.,
Chicago 3, Illinois.

Paper No. 15

(Stamp) U. S. Patent Office Board of Appeals Oct 21 1955
Mailed

Appeal No. 413-18
Hearing:
October 13, 1955

IN THE UNITED STATES PATENT OFFICE

Before the Board of Appeals

Ex parte Richard T. Keating

Application for Patent filed November 22, 1950, Serial No. 197,036. Deep Fryer.

Mr. Lowell F. Hammand for appellant.

This is an appeal from the final rejection of claims 1 to 6, inclusive, which are all of the claims in the application.

Claim 1, which is the most specific of the claims on appeal, reads as follows:

> 1. A deep fryer comprising, in combination, an open front housing, with a frying vessel supported thereon and spaced from the front thereof and a burner compartment between the forward edge of the frying vessel and the front of the housing, said frying vessel having a sloping bottom for the frying vessel extending downwardly and inwardly from each side of the vessel and downwardly and forwardly from the rear edge of the vessel to the forward edge thereof, with a drain valve and spout mounted on the lower-

> most point of the frying vessel and extending from the forward edge of the vessel downwardly, forwardly and outwardly through the open front of the fryer housing; together with a convex door on the fryer housing extending around and enclosing said drain valve and spout, with a base for the fryer housing having a recess extending inwardly under the drain valve and spout and adapted to receive a portable container into the open front of the housing.

The references relied upon are:

Swindell	366,701	July 19, 1887
Kells	2,429,360	Oct. 21, 1947
Pappas	2,528,776	Nov. 7, 1950

This application relates to a deep fat frying device, of the same general type as that shown in the patent to Pappas No. 2,528,776, cited above, comprising a supporting cabinet, gas burner apparatus, a frying vessel, a drain and drain spout for draining off the contaminated cooking fats from the frying vessel, and a door at the front of the cabinet providing access to the drain spout. Appellant's fryer differs from that of Pappas as to certain of its details, involving the form and physical disposition of the burners, the specific location of the drain at the bottom of the frying vessel, the direction of extension of the drain spout, and the shape of the access door, the particular natures of all of which details in appellant's structure are evident from the representative claim reproduced above.

The claims at bar have been rejected as unpatentable over Pappas in view of Kells and Swindell, it being held by the examiner that the various differences over Pappas in respect to the details as mentioned above are not patentable, either as being suggested by the secondary references or else as falling generally within the skill of the art.

We are in agreement with the examiner that the claims on appeal present no patentable distinction over the prior art. We note that neither the examiner nor appellant has made any specific issue as to the form of the burner apparatus and its disposition relative to the cabinet and the frying vessel. While the burner arrangement illustrated in Pappas does not conform precisely to that recited in claims 1, 2 and 3, we find no patentable significance in this component as recited, since Kells clearly discloses a broadly equivalent burner arrangement falling within the terms of said claims as to such feature, and the substitution thereof for that shown in Pappas would, in our opinion, fall well within the ordinary skill of the art.

Insofar as the location of the drain opening at the bottom of the frying vessel toward the front of the cabinet, and the forward and downward inclination of the drain spout therefrom are concerned, we are not impressed by appellant's arguments concerning the advantages to be obtained from such disposition. We think, in conformity with the examiner, that the adoption of such structural disposition is indicative merely of an unpatentable matter of choice involving obvious optional variations that would properly be open to and within the capabilities of the person skilled in the art. In our estimation, if any difficulties were encountered in the emptying of the frying vessel of Pappas because of the location of the drain and drain spout thereof, the avoidance of such difficulties by relocation of these components nearer the front of the cabinet would be readily discernible to the operator. In this connection, the structural association for such variation would clearly be broadly suggested by Kells, wherein the drain opening and drain spout, although perhaps not located adjacent the actual front wall of the enclosing cabinet, are nevertheless disposed asymmetrically in proximity to an outer wall of said cabinet. Moreover, Swindell discloses it to be old in a cooking apparatus involving the draining of cooking fats, to locate the drain spout therefor, as well as a recess for the drain pan or receptacle, at the front of the enclosing cabinet of said cooking apparatus. Additionally, as to such recess, the patent to Pappas itself discloses a space beneath the drain spout into which the drain pan 8 may be placed, which space clearly corresponds to the terms of the recess feature as recited in claims 1 and 4.

Pappas shows an access door for his cabinet, which may be regarded broadly as enclosing the drain valve and spout, and we agree with the examiner that it would constitute merely an unpatentable matter of design to configure such door in the convex manner called for in claims 1, 2, 4 and 5, cabinet doors of convex shape being notoriously old and well known in many fields of endeavor. It appears that appellant has merely taken the old and well known fryer apparatus of Pappas and supplied thereto a plurality of optional variations of obvious character as shown above, the association of which would produce only the aggregate of the individual results to be expected therefrom.

We have carefully considered the various arguments and contentions advanced by appellant, both in the brief and at the oral hearing, but for the reasons given we deem the claims on appeal not patentable over the prior art.

The decision of the examiner is affirmed.

Mark Taylor, *Examiner-in-Chief*, M. H. Friedman, *Examiner-in-Chief*, Louis F. Kreek, *Examiner-in-Chief* (*Acting*).	Board of Appeals

October 21, 1955.

Mr. Lowell F. Hammand,
135 South LaSalle St.,
Chicago 3, Illinois.

PLAINTIFF'S EXHIBIT NO. 7-A.

Research Bulletin No. 24

Research in Fundamentals of Immersion Tube Heating With Gas

First Bulletin—Project No. 47

Supervised by
COMMITTEE ON INDUSTRIAL GAS RESEARCH
JOHN W. BATTEN, Chairman

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PREFACE

This bulletin represents the ninth publication on industrial gas research conducted by the American Gas Association at its Testing Laboratories under supervision of the Committee on Industrial Gas Research. The industrial gas research program initiated in 1935, and since carried forward almost continuously, has covered a wide range of projects such as elimination of noise in industrial burners, effect of preheated air on economy of operation and combustion characteristics, combustion chamber space requirements and wall temperatures, and combustion of gas with a limited air supply.

Constituting the first bulletin covering research on gas immersion tubes for industrial and commercial heating purposes this publication presents results of a comprehensive investigation culminating in development of a mathematical approach for predicting heat transfer efficiency and heating capacity of various lengths and diameters of tubes suitable for industrial heating application. In addition, possibilities of improving performance of small immersion tubes employed in deep fat dryers were explored thoroughly for atmospheric gas burners, and on a more limited scale for pressure burners. An experimental deep fat fryer embodying principles developed during this phase of the investigation was constructed and found by test to be superior to contemporary models in respect to heating speed and thermal efficiency.

Acknowledgment is made of assistance given by the Surface Combustion Corp., Eclipse Fuel and Engineering Co., Universal Burner Co., The Selas Company, Anetsberger Bros., Golden Brown Appliance Mfg. Co., J. C. Pitman & Sons, Inc., and Standard Gas Equipment Co. Members of the Laboratories staff who conducted the experimental work were Herman Benditz, F. H. Butze, and E. C. Calvert.

R. M. Conner, *Director*
American Gas Association
Testing Laboratories

Cleveland, Ohio
March, 1944

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RESEARCH IN FUNDAMENTALS OF IMMERSION TUBE HEATING WITH GAS

ABSTRACT

Data are presented showing lengths of industrial gas immersion tubes required for a predetermined heat output and thermal efficiency; diameters of immersion tubes required for complete combustion of a given quantity of gas with various types of burners; effect of baffles on heat transfer characteristics in immersion tubes, and; influence of vertical stack height on capacities of immersion tubes equipped with atmospheric type burners. There is included a brief correlation of experimental data with fundamental flow and heat transfer characteristics.

Essential performance characteristics are presented on commercial immersion tube type deep fat fryers operating at the manufacturer's specified input rates as well as at increased input rates. Data are given demonstrating improvement in heating speed and heat transfer characteristics of commercial units by addition of vertical stack height and placement of baffles in the immersion tubes; effect of cross-sectional shape and size of immersion tubes for deep fat fryer application on heating speed and efficiency characteristics, and; improved performance characteristics of immersion-tube deep fat fryers equipped with power burners and highly baffled tubes. Results are included showing the necessity of increasing heat transfer surface areas materially if substantial improvement in preheating speeds and thermal efficiencies are to be made with atmospheric type burner equipment and without condition of objectionable vertical stack heights.

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III. GAS IMMERSION TUBES FOR DEEP FAT FRYERS

One of the most popular but comparatively recent applications of immersion tube heating has been in hotel and restaurant deep fat fryers. Immersion tube heating is particularly well qualified for this purpose since it is capable of providing a cool zone at the bottom of the cooking compartment. This characteristic prevents rapid deterioration of the cooking oil, therefore, providing more satisfactory and economical performance.

Due to the small overall size of many commercial types of deep fat fryers, the area of the heating surface available with the round tubes commonly employed is quite limited. The purpose of this investigation was to determine the possibilities of improving heat transfer rates in deep fat fryer immersion tubes notwithstanding inherent difficulty presented by limited heat transfer area.

A. SUMMARY OF RESULTS:

1. It was found that with conventional types of deep fat fryer immersion tubes it is not feasible to increase substantially the heat transfer rate per sq ft of heating surface, since any significant improvement in this direction may result in temperatures of heating surfaces exposed to the cooking oil exceeding the maximum permissible limit set forth in the American Standard Approved Requirements for hotel and restaurant deep fat fryers.

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2. Substantial improvement in heating speed and capacity characteristics of commercial deep fat fryers can only be brought about within maximum surface temperature limits now specified, by increasing areas of effective heating surfaces. Forced circulation of cooking oil, if practicable, would permit attainment of considerably higher heating speeds with heating surface areas of the same order as those now employed on contemporary fryers.

Page 30

3. Disregarding heating surface temperature limitations, increase in output of contemporary deep fat fryers can be brought about by use of increased stack height up to 6 ft and baffling. For example, with 6 ft of vertical stack attached to the flue outlet of a deep fat fryer and with the immersion tubes baffled to provide optimum heat transfer and combustion conditions it was possible to increase the input rate by approximately 100% and gain an increase in heating speed of 60% when compared with performance of the same unit without stack and baffles.

Page 27

4. Increase in heat output of contemporary deep fat fryers could also be effected by application of an open type pressure burner. Under this condition the heating speed was almost doubled with practically no decrease in thermal efficiency from that obtained with the original atmospheric burner equipment.

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5. For various contemporary deep fat fryers it was found that the temperature differential between cooking oil and metal heating surfaces varied widely but did not appear to bear any definite relationship to input rating. Oil temperatures in the crumb receptacle were low on all fryers; the maximum oil temperatures in this zone being observed on the fryer with the smallest clearance (1 in.) between tubes and the bottom of the receptacle.

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6. Studies made of the effect of different shapes and different types of baffling of short immersion tubes (15 in.) on their performance with atmospheric burners are briefly discussed as follows:

Pages 29 and 30

a. Combustion in 1 in. diameter tubes or rectangular tubes of comparable size was unsatisfactory at any reasonable gas input rate.

b. For equivalent areas of heating surface, a 2-in. diameter tube had greater output than rectangular shaped tubes.

c. For a given cooking vessel width, narrow and deep rectangular shaped immersion tubes had the greatest heat output since a greater

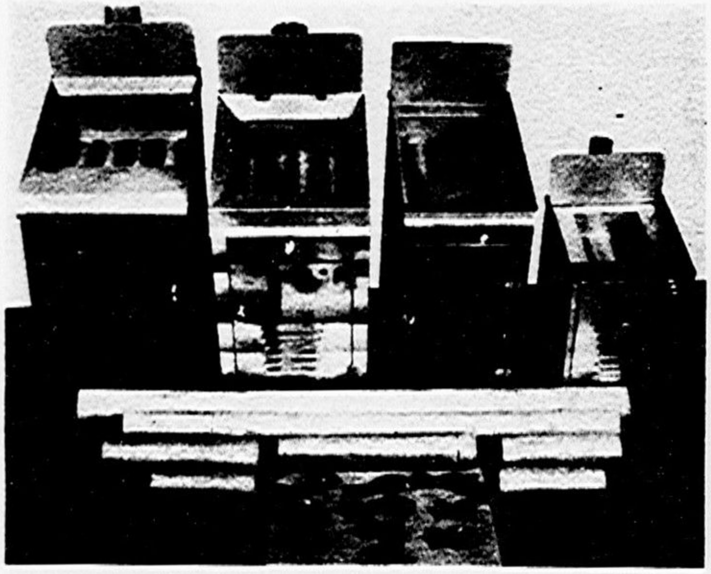

FIG. 22—Deep Fat Fryers Used in this Investigation Showing Immersion Tubes, with Different Lengths of Flue Pipe and Spiral Baffles Used With Them in Foreground.

number with resultant increase in heat transfer area could be employed in a given width.

d. For individually fired rectangular shaped immersion tubes, a 1 in. width gave the best performance as combustion difficulties were encountered with narrower units.

e. Disc type baffles in 2 in. diameter tubes increased the thermal efficiency when a short stack was used. Lower inputs however were required.

f. Fin type baffles welded to the circular tube wall were effective in increasing heat output of the individual tube. However, on the basis of a given cooking surface width, the collective output of such tubes would be considerably lower than unbaffled narrow rectangular shaped tubes.

7. Results obtained with an experimental deep fat fryer constructed to embody principles developed during this research are briefly mentioned in the following paragraphs.

Pages 30 and 31

a. An immersion tube type deep fat fryer was constructed with ½ in. wide and 2½-3 in. deep tubes with ½ in. clearance between them to give a large heating surface. A single burner with vertical ports was placed below and at right angles to the tubes which vented from a common combustion chamber. This avoided the difficulty attending individual firing of narrow tubes and also provided quieter operation.

b. The experimental model had a heating speed practically equal to the highest obtained in commercial units with maximum input ratings. This was accomplished with a 20% (actual) higher thermal efficiency than that obtained on the commercial unit.

c. Temperature differential between metal surfaces and between top and crumb receptacle oil temperatures were satisfactory.

d. Results obtained on the experimental model demonstrate the possibility of greatly improved performance by increasing the area of heating surface of immersion tube type deep fat fryers.

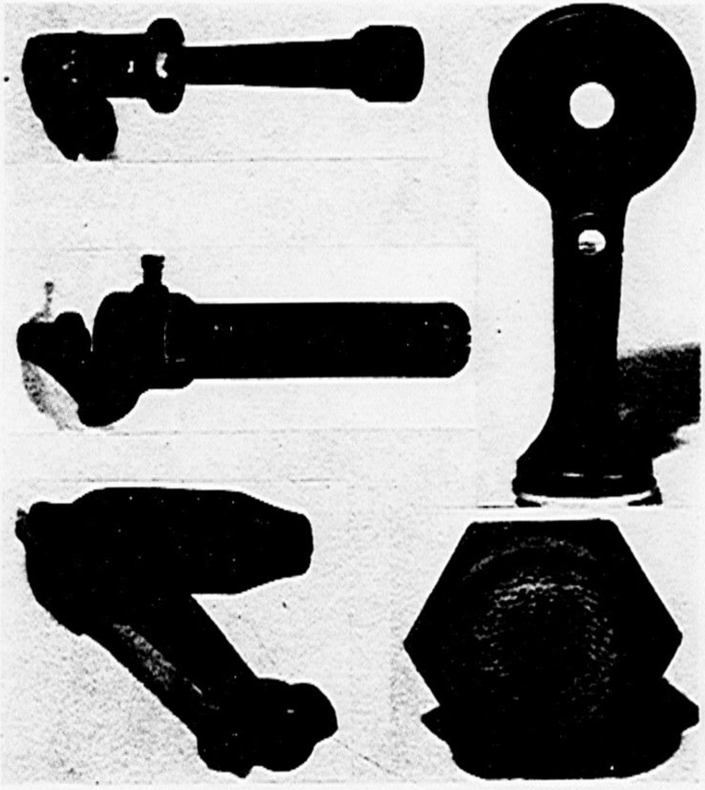

FIG. 23—Four Atmospheric Immersion Burners for Deep Fat Fryers and One Improvised Power Burner (lower right).

B. PERFORMANCE FEATURES OF COMMERCIAL DEEP FAT FRYERS STUDIED

Four commercial deep fat fryers were employed for studies of their performance as received and also when supplied with special burner and baffle equipment. These are shown in Fig. 22. Dimensions of each and pertinent descriptive data are included in Table 7.

These appliances were normally equipped with atmospheric type burners shown in Fig. 23. One unit equipped with a power burner as shown in lower right of this same figure was subjected to special tests. Arrangements for studies of deep fat fryers with power burners are shown in Fig. 24 together with accessory equipment.

Special immersion tubes of varying cross-sectional shapes and with a length of 15 in. of water-backed surface were welded in cylindrical containers 6 in. in diameter as shown in Fig. 25 for circulation of water during thermal efficiency tests. Tubes of rectangular cross-section varied in width from ½ to 2 in. and in height from 1 to 4 in. The circular tubes ranged from 1 to 3½ in. in diameter with the 3½ in. diameter size incorporating longitudinal fins of ½ and 1½ in. respectively. In addition, the 2 in. diameter tube was equipped with disc type baffles of varying diameter.

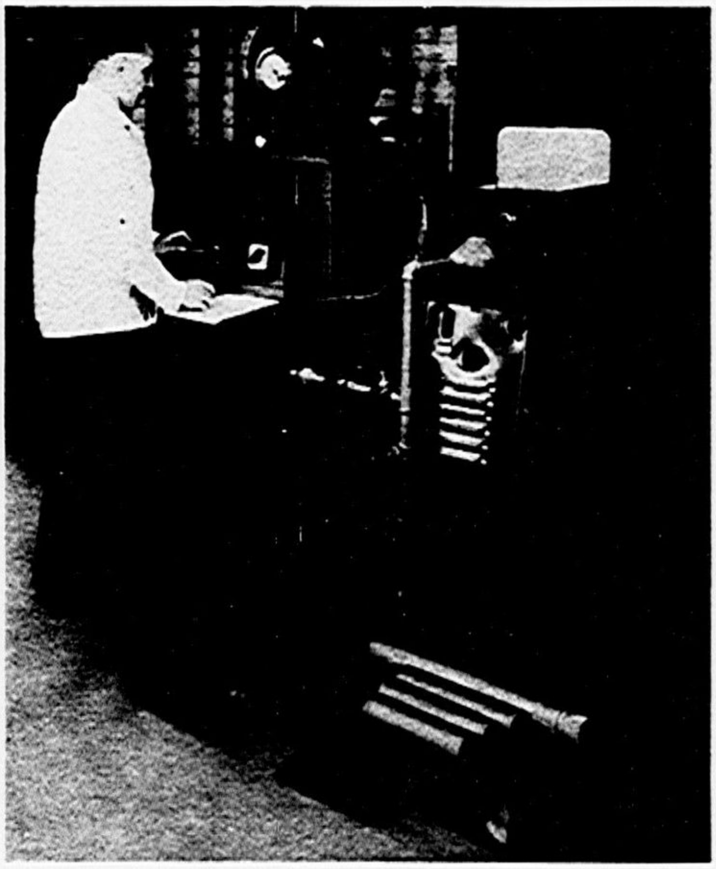

FIG. 24—Measurement of Immersion Tube Wall Temperatures of Deep Fat Fryer No. 4 with an Improvised Power Burner. Baffles and Flue Pipe Used Shown in Foreground.

TABLE 7—Description of Immersion Tubes and Cooking Vessels of 4 Commercial Deep Fat Fryers Used in This Investigation

Appliance		No. 1	No. 2	No. 3	No. 4
I.D. of Tube, In		2 9/32	2 17/32	2 5/16	3¼
O.D. of Tube, In		2½	2¾	2½	3½
Tube Length, In		14	15 13/16	16 11/16	11¼
No. of Tubes		3	4	4	1
Total Internal Heating Surface, Sq Ft		2.085	3.488	3.364	0.796
Total External Heating Surface, Sq Ft		2.290	3.80	3.64	0.860
Top Dimensions of Cooking Vessel		14 x 13⅞	15¾ x 16	18 x 18	11¼ x 8½
Lbs of Water Used for Heating-Up Capacity Test		40	68	85	15.35
Lbs of Oil Used for Heating-Up Capacity Test		31.8	47.6	71.4	11.75
Normal Depth of Liquid	Above Top of Tubes, In	2½	3	4	2
	Below Bottom of Tubes, In	11/16 at walls 3¼ at center	¼ at walls 2⅝ at center	11/16 at walls 2¾ at center	½ at walls 1 at center
Manufacturer's Input Rating, Btu–Hr–Tube		10,000	11,500	10,000	14,000
Height of Flue Gas Collector Box, In		2⅞	5⅛	3½	7¾
Height of Manufacturer's Flue Pipe, In		11	15	12	7

A small atmospheric type single port burner with a 2½ in. x 3/16 in. wing tip attachment as shown in the upper right hand corner of Fig. 25 was used in the narrow rectangular tubes. For the round and larger rectangular tubes, both a single port burner ¾ in. I.D. with corrugated strip around its periphery for flame retention and a multiple port burner 2¼ in. diameter and with 36 No. 30 D.M.S. ports were employed.

A deep fat fryer unit having a large heating surface area and provided with a burner suitable for a high gas input rating was consrtucted and subjected to various tests. A photograph and diagrams of this unit are included as Figs. 26 and 27.

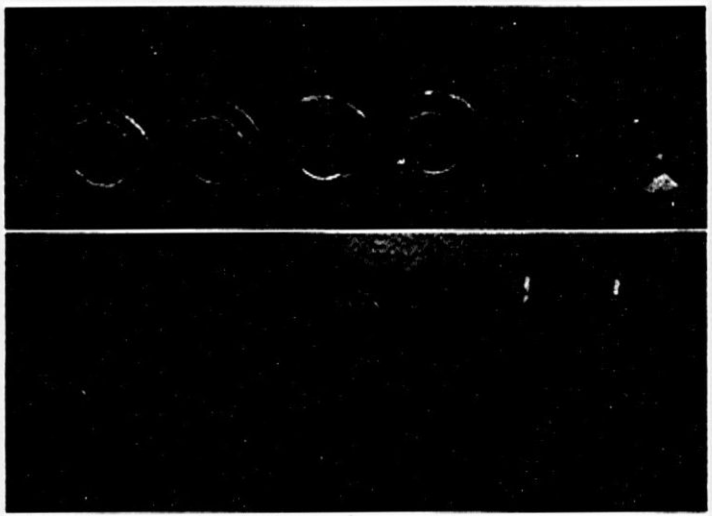

Fig. 25—Heat Exchangers and One of the Atmospheric Burners Used in Determining Effect of Baffles and Shape of Flueways in Short Immersion Tubes.

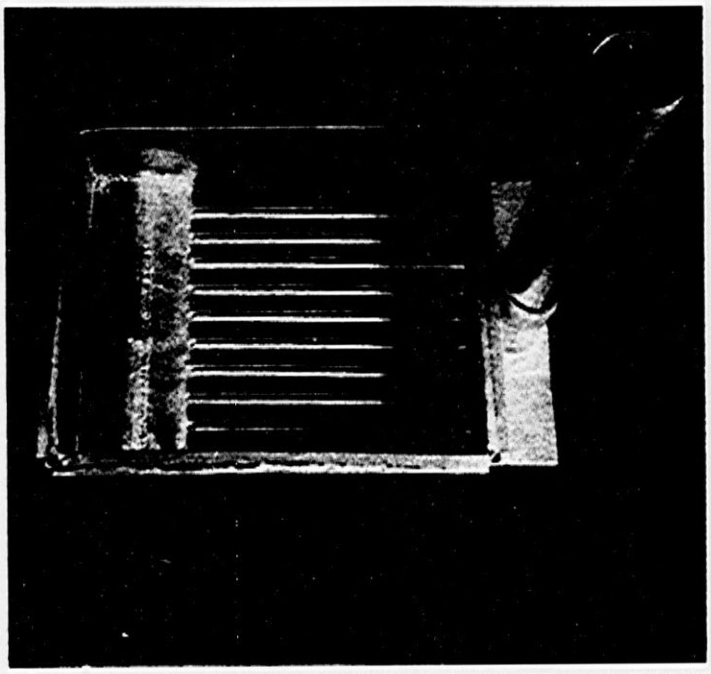

Fig. 26—Top View of Experimental Model Deep Fat Fryer with 2 ft. of Stack.

Natural gas of 1,120 Btu per cu ft and 0.63 sp gr was utilized throughout this investigation. Heating speed, thermal efficiency, combustion, heating surface temperature and oil temperature studies were made on all units as outlined in American Standard Approval Requirements for Hotel and Restaurant Deep Fat Fryers. Similar procedure was followed in a series of studies at increased gas input rates with different degrees of baffling and added stack up to a maximum of 6 ft to insure complete combustion. The test arrangement for thermal efficiency determinations is shown in Fig. 28. Comparative heating speed tests were made with water as the heating medium employing a 140 F temperature rise above room temperature in place of the 300 F temperature rise with cotton seed oil as specified in standard tests. Accompanying data such as percentage CO_2 in flue gas, flue gas temperatures and total gas consumptions were recorded for each test condition.

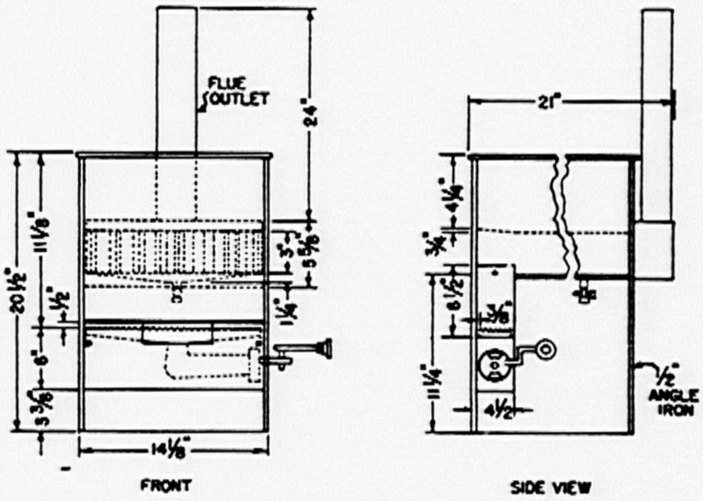

Fig. 27—Diagramatic Sketch of Experimental Model Deep Fat Fryer.

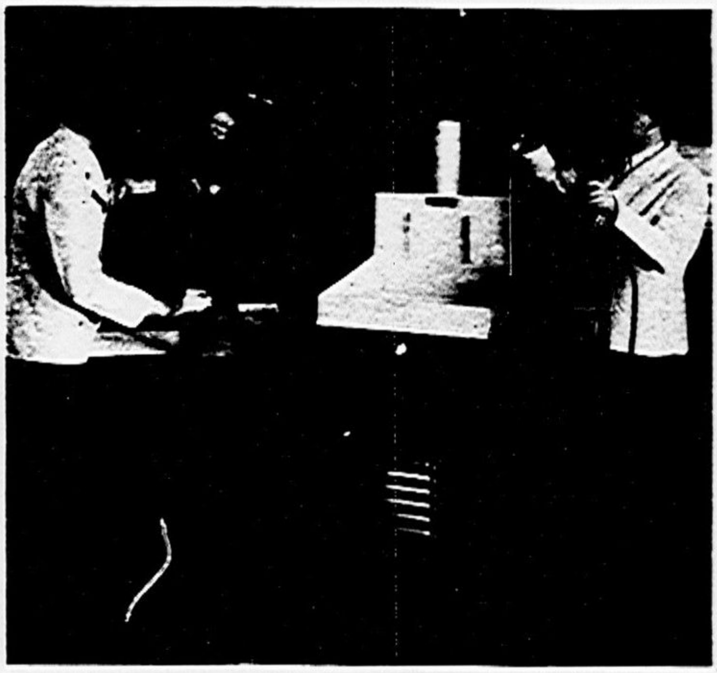

FIG. 28—Arrangement of Equipment for Thermal Efficiency Test on Deep Fat Fryers.

Comparative thermal efficiencies on short immersion tubes, especially conducted for this invesigation with various cross-section and types of baffling, were determined with water circulating through a cylindrical shaped chamber surrounding the individual immersion tube as shown in Fig. 29. A 30-minute test through a temperature rise of 60 F above room temperature and various gas input ratings was employed for each unit. Concentration of CO_2 in the flue gas was maintained at 10% if possible, otherwise at 8% by restriction of the flue outlet. Flue gases were sampled and analyzed for carbon monoxide.

Heat transfer data obtained with the special type immersion tubes were correlated and a special model deep fat fryer designed. This model was subjected to tests similar to those applied to the commercial units as previously described.

1. EFFECT OF INCREASED GAS INPUT ON HEATING SPEED OF CONTEMPORARY DEEP FAT FRYERS

The most obvious method of increasing heating speed of contemporary fryers would be to increase the gas input rate. If input rate is to be increased without sacrifice in thermal efficiency in horizontal immersion tubes, it is necessary to add vertical stack to the flue outlet for adequate chimney effect and to increase baffling at the same time so that increased flue gas velocities and maximum "scrubbing" action of the flue gases will be obtained. The extent to which the gas input rating may be increased by added stack is illustrated by Fig. 30. The 53% increase in rating attained by addition of 6 ft of stack to fryer No. 2, as shown, is representative of results obtained on all fryers studied. It will be observed that the curve begins to level out at 6 ft of stack, thus indicating that no appreciable increase in input rating could be expected by a further increase in stack height.

Increased heating speeds obtianed in the 4 fryers by means of added stack height are presented in Fig. 31. A single section of baffle was used throughout, this representing the original equipment except for unit No. 3 on which a baffle similar to that employed in fryer No. 1 was used.

Data were plotted on the basis of input per lb of cooking oil to reduce all test results to a comparable basis. From a practical viewpoint fryers should be compared on the basis of the weight of cooking oil above the tube since this is the usable space. However, design of each of the 4 fryers was such that approximately one-half of the total weight of cooking oil was above the tubes so that

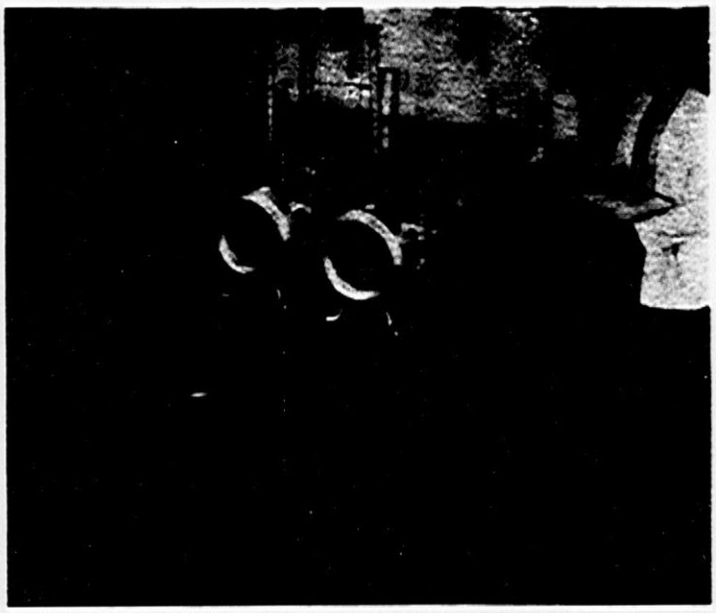

FIG. 29—Test Set-up for Determining the Thermal Efficiency of Short Immersion Tubes.

results based on total weight of cooking oil are believed to be comparable both on this basis as well as from the practical consideration of usable space.

As will be observed, heating speed of fryer No. 1 was considerably greater than that of the others for a comparable input rate. This superior performance was probably due to the comparatively large heating surface per lb of oil; moreover, tubes on fryer No. 1 were baffled to give a comparatively high percentage of CO_2 in the flue gases. Fryer No. 2 compared favorably with No. 1. However, its flueways were apparently less effectively baffled which accounted for its lower heating speed. The lowest ratio of heating surface to oil capacity was found on fryer No. 3, while the immersion tubes on fryer No. 4 were very short, these factors respectively accounting for their lower heating speeds.

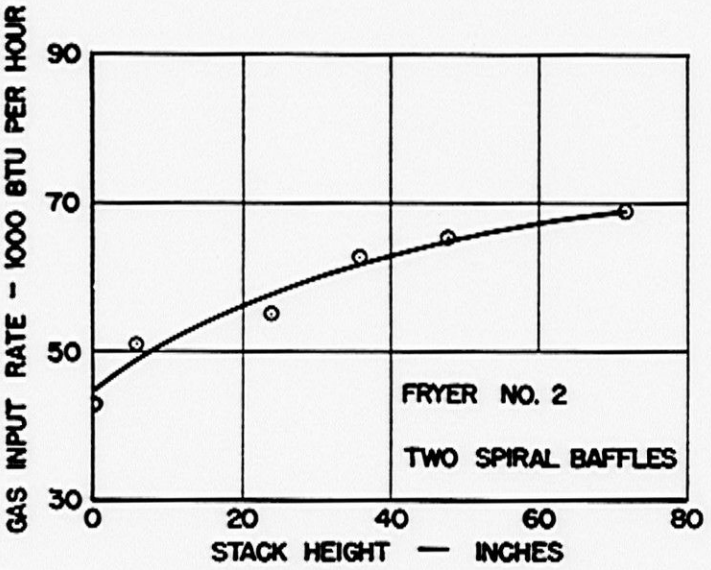

FIG. 30—Effect of Added Stack Height on Maximum Gas Input Rating of a Deep Fat Fryer.

Heating speeds of all 4 fryers increased rapidly with increased input ratings. For example, the maximum heating speed of fryer No. 1 with increased input rate was almost double that obtained with the original input rate; likewise, it will be noted that for equivalent heating speeds, gas consumption of fryer No. 1 was less per lb of cooking oil.

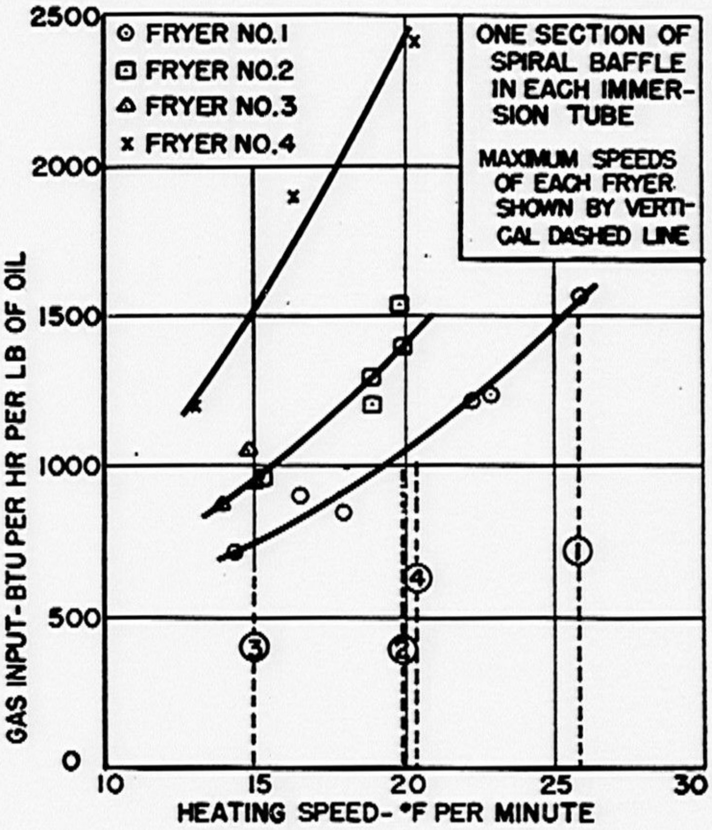

FIG. 31—Comparison of Heating Speeds Obtained on Four Representative Deep Fat Fryers at Various Gas Input Rates

2. EFFECT OF BAFFLES IN IMMERSION TUBES

Data in Fig. 32 show the effect of an additional baffle in fryer No. 2 when stack heights were varied to permit complete combustion at different gas input rates. It is of interest to note that the

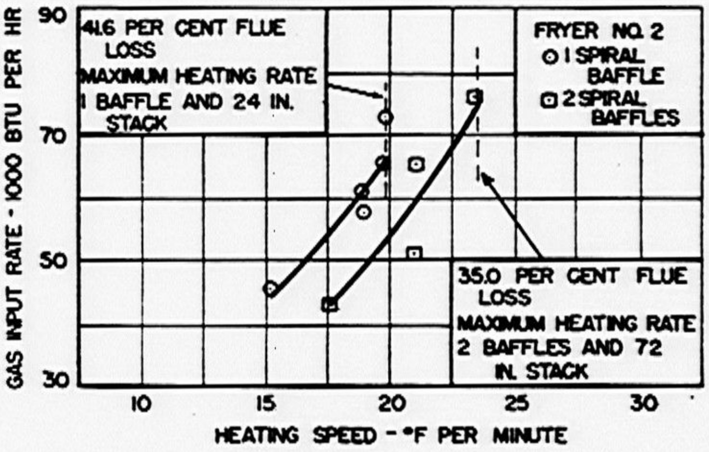

FIG. 32—Increased Heating Speed Obtained with Additional Baffles at Various Gas Input Ratings.

maximum heating speeds with this appliance, 20 and 23.5 F per minute with 1 and 2 baffles respectively, were observed with approximately the same percentage CO_2 in the flue gases (5.8%) but that the flue loss with the No. 2 baffle was considerably lower due to greater heat transfer accompanying the turbulence caused by increased flue gas velocities and additional baffling.

3. POWER BURNERS

There are definite limitations to the extent that heating speed may be increased with atmospheric type burners operating at increased input rates. Maximum heating speeds were approached with stack heights of 7 ft and it is problematical whether such lengths would be acceptable for field use. Likewise, increased baffling cannot be employed unless vertical stack is added to compensate for the resultant increased frictional resistance to flue gas flow. Two possibilities are presented for increasing heating speeds; namely, use of additional heating surface area, or of power burners either of the pressure or induced draft type. The former alternative involves major changes in design which will be discussed later. The latter, of course, merely requires a change in burner equipment. To ascertain potentialities of of power burners an improvised multiport burner as shown in the lower right corner of Fig. 23 was employed in tests on fryer No. 4. This model presented unusual difficulties to improvement in heating speed because of its short tube length and limited heating surface area. The test arrangement, including various types of baffles studied, is shown in Fig. 24.

Comparative results obtained on this unit when operated successively with atmospheric and power burners are illustrated by Fig. 33. From this data it will be observed that a substantial increase in heating speed accompanied use of the power burner. This burner also permitted attainment of a higher thermal efficiency as indicated by the respective flue losses. In fact the flue loss at maximum input rate (28,300 Btu/hr) with the power burner was only 2% higher than at the manufacturer's input rate (14,000 Btu/hr) with the original baffle. Use of the same disc baffle with the atmospheric burner as with the power burner was unsatisfactory since combustion became impared at input ratings sufficiently high to produce a heating speed of 25 F per minute.

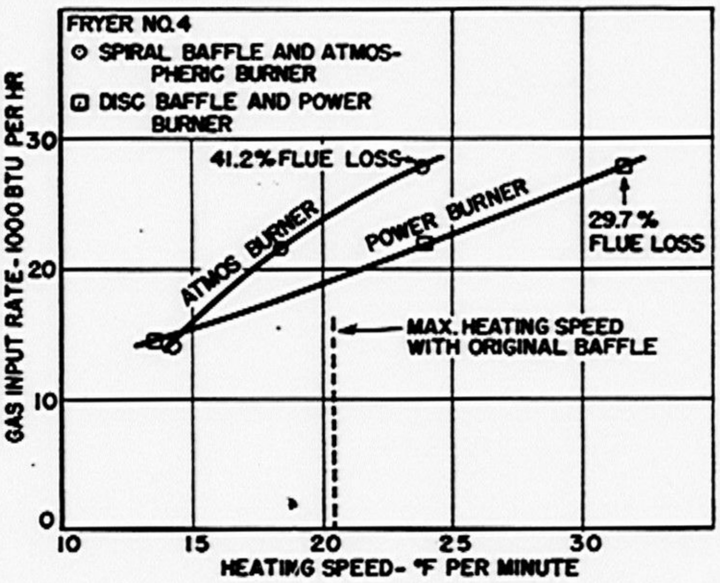

FIG. 33—Comparison of Heating Speeds Obtained with Atmospheric and Power Burners.

These results definitely indicate the possibilities of improved preheating speed performance with power burners. However, their general application by the industry depends on many other factors such as increased initial cost and the use of external motive power. Moreover, temperatures of metal surface exposed to the cooking oil may reach excessive values with consequently rapid oil deterioration if the high heat transfer rates possible with power burners are fully utilized.

4. EFFECT OF INCREASED GAS INPUT ON THERMAL EFFICIENCIES OF REPRESENTATIVE DEEP FAT FRYERS

In order to evaluate more accurately the effect of increased input rates on heat transfer through immersion tubes to liquid, a series of thermal efficiency studies was made on each of the 4 deep fat fryers at various input ratings. Combinations of baffling and vertical stack heights with which best heating results prevailed were employed in these studies. Unit 4 was equipped with a power burner since it could accommodate a much wider range of input ratings. Results of these studies are presented in Table 8.

Thermal efficiency results for each of the 4 appliances followed the same general trend; i.e., decreasing efficiency with increased input rate. This ranged from 1280–2680 Btu per hr of increase in input per 1% (actual) loss in efficiency.

Although the thermal efficiency of each fryer decreased with increase in input rating, the total heat output increased considerably with higher inputs. Heat output indicated by each efficiency test in terms of Btu per hr per sq ft of internal surface is also included in Table 8. Relationship between input and output ratings in Btu per hr per sq ft of internal heating surface is shown graphically in Fig. 34. Correlation of all results on this basis revealed comparable performance of each appliance as indicated by data defining the single average curve shown in Fig. 34. By referring to this curve, it will be noted that by doubling the input rate the output is increased by approximately 60%.

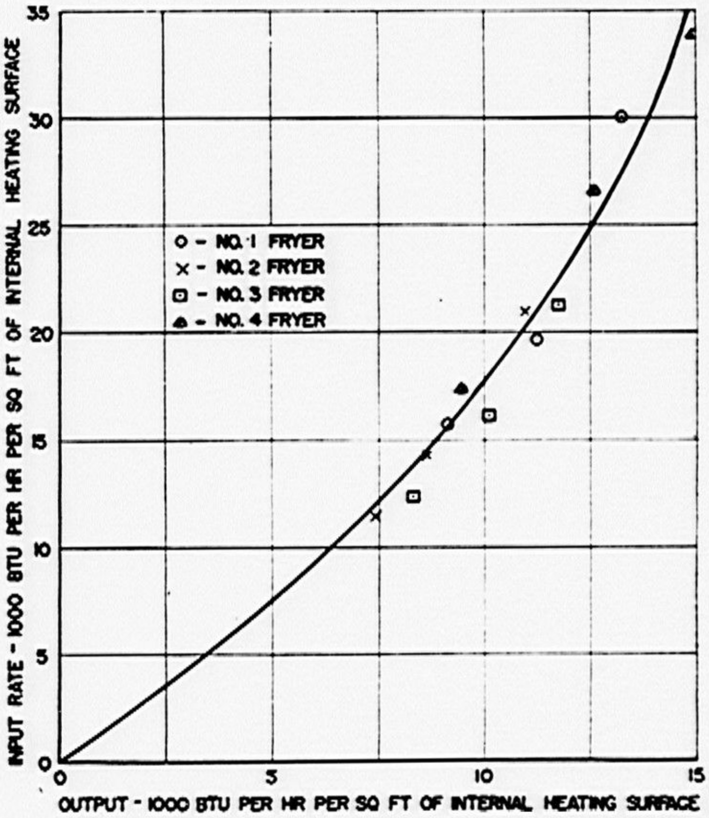

Fig. 34—Relation of Heat Output to Input for Four Deep Fat Fryers Studied.

Table 8—Thermal Efficiency Data on Fryers Studied at Various Input Ratings

Test No.	Fryer No.	Input Rate: Btu/Hr	Input Rate: Btu/Hr/Sq Ft Internal Surface	Output Btu/Hr/Sq Ft Internal Surface	Thermal Efficiency %	Added Stack Height In.	Type of Baffles Etc.
1	1	32,850	15,620	9,380	60.0	6	2 Spiral baffiles extending about two-thirds of tube lengths.
2	1	41,000	19,650	11,250	57.3	24	“
3	1	62,650	30,000	13,450	44.8	72	“
4	2	40,000	11,500	7,420	64.6	0	“
5	2	50,100	14,380	8,680	60.3	6	“
6	2	73,200	21,000	10,950	52.2	72	“
7	3	41,700	12,400	8,370	67.5	0	“
8	3	54,000	16,050	10,150	63.20	6	“
9	3	71,800	21,300	11,750	55.2	72	“
10	4	13,860	17,400	9,480	54.5	0	1 Spiral baffle extending entire length of tube and power burner.
11	4	21,200	26,600	12,650	47.6	37	“
12	4	26,900	33,800	14,950	44.3	47	“

5. Heating Surface and Cooking Oil Temperatures

Two features are generally considered desirable in deep fat fryers; first, that metal temperatures do not greatly exceed those of the oil at any time, and second, that oil temperatures at the bottom of the crumb receptacle approach room temperature so that deterioration of the oil will not be brought about by continued heating of food particles. According to American Standard Approved Requirements for Hotel and Restaurant Range Deep Fat Fryers, metal temperatures shall not exceed oil temperatures by more than 135 F and oil temperatures in the crumb receptacle shall not be greater than 100 F below the top oil temperature.

Investigation of the 4 commercial deep fat fryers revealed a wide variation in metal temperatures as illustrated by Fig. 35. The curves numbered 1, 2, 3, and 4 in Fig. 35 indicate the metal temperatures at four equidistant points along the walls of the tubes, beginning at the front and extending to the rear of the unit. Although numerous observations were made, it was not possible to correlate the wide difference between oil and heating surface temperatures for various fryers on the basis of design elements or input rates. Circulation of the oil, heat input and position and type of baffles undoubtedly have some influence on the temperature differential between the oil and metal. However, the wide differential between temperatures observed on fryer No. 3 may be partially attributed to the high input and heat transfer rates.

Low temperature crumb receptacles were incorporated in all 4 fryers studied. This characteristic is inherent with the immersion tube type of heating application and the degree of coolness of the oil in the crumb receptacle is apparently a function of the distance between tubes and bottom surfaces of the crumb receptacle. This is shown by Fig. 36 which includes data for the two fryers on which the highest and lowest temperature in the crumb receptacle were observed. Moreover, these 2 units also provided the minimum and maximum clearance respectively between tubes and bottom of the crumb receptacles. It is significant to note, however, that the fryer with the highest crumb receptacle temperature complied with American Standard Approval Requirements thus indicating that very little clearance below the tubes is required to obtain the desired result.

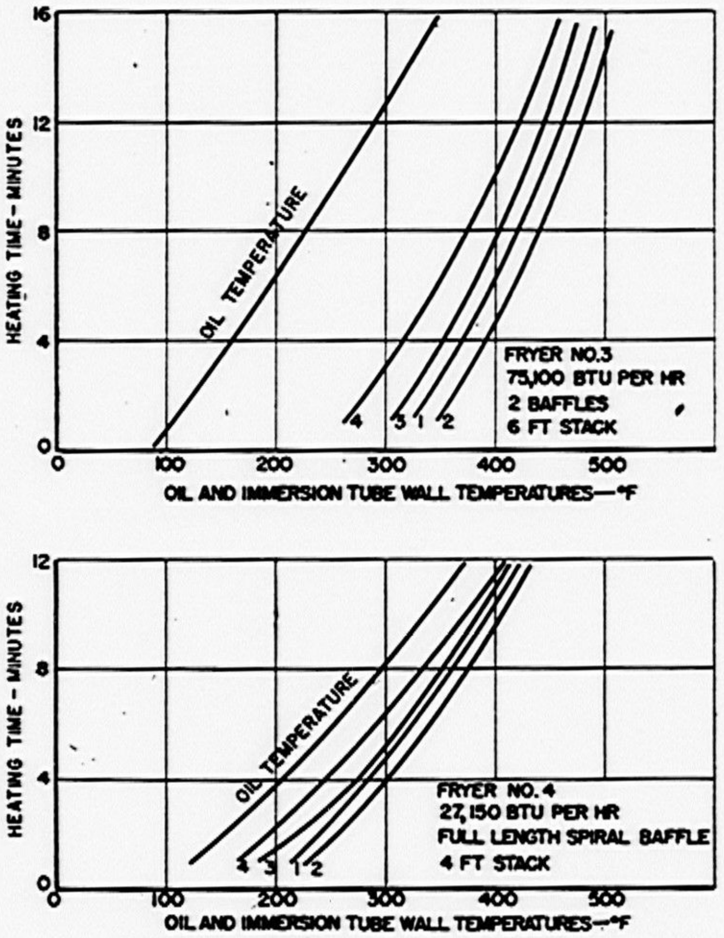

Fig. 35—Temperatures of Cotton Seed Oil and Immersion Tube Walls During Heating up Process on Fryers Nos. 3 and 4.

C. DESIGN OF EXPERIMENTAL IMMERSION TUBES FOR IMPROVED PERFORMANCE WITH ATMOSPHERIC GAS BURNERS IN DEEP FAT FRYERS

Studies of representative immersion tube type deep fat fryers indicated that any appreciable improvement in heating speed with atmospheric burners could probably only be attained with a sacrifice in thermal efficiency and use of high vertical stacks which may not be acceptable to the industry. In addition, flue gas temperatures at the higher input ratings were very high and these might serve to shorten the life of the unit considerably.

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Analysis of the problem indicated two general methods of increasing the heating speed of deep fat fryers, one by increasing either the efficiency or area of the heating surface and the other by use of power burners with small diameter or highly baffled tubes. Since the latter method is outside the scope of the present investigation, except determination of power burner potentialities as previously outlined, these studies were concentrated on methods of improving performance with atmospheric type burners.

1. Effect of Shape of Experimental Immersion Tubes

In order to determine effect of shape of tube cross-section on performance of short immersion tubes, various sizes of rectangular and circular tubes were constructed and welded into cylindrical containers as shown in Fig. 25. Thermal efficiencies of each were determined over a wide range of input rates by regulating water flow through the outer jacket to limit temperature rise to 60 F. Test arrangement is shown in Fig. 29. Results obtained at maximum throughputs consistent with complete combustion are presented in Table 9.

For equivalent heating surfaces, it will be noted that the 2-in. diameter circular tube yielded a

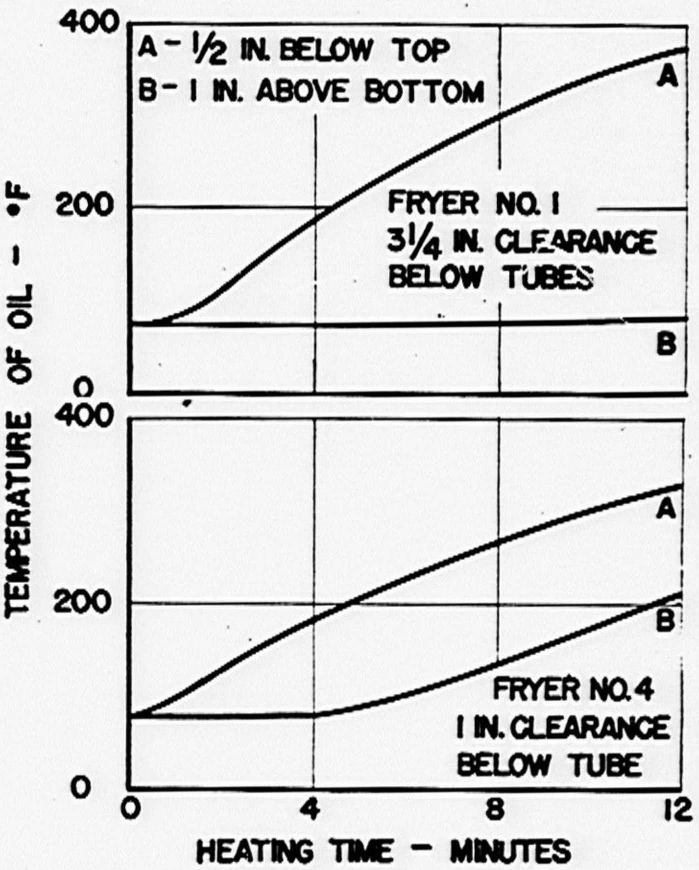

Fig. 36—Oil Temperature Differential in Fryers Having Minimum and Maximum Clearance Between Tubes and Bottom of Crumb Receptacle.

Table 9—Maximum Heat Outputs Obtained on Various Shapes and Types of 15 Inch Long Immersion Tubes

Description of Tube				Baffle		Maximum Input Btu–Hr	Maximum Output Btu–Hr
Shape of Cross-Section	Width In.	Depth In.	Surface Area Sq Ft	Type	No. of Baffles or Fins		
Rectangular	2	2-½-3	0.972	—		9,430	5,680
Rectangular	1	2-½-3	0.780	—		10,600	5,600
Rectangular	2-½-3	1	0.780	—		10,640	5,850
Rectangular	¾	2-½-3	0.729	—		6,040	3,700
Rectangular	⅝	2-½-3	0.704	—		2,964	2,010
Rectangular	13/16	1-½-2	0.495	—		Failed combustion	
Circular	1 (diam)		0.327	—		Failed combustion	
Circular	2 (diam)		0.654	—		7,760	4,730
Circular	2 (diam)		0.654	1 In. Disc	3	6,242	4,650
Circular	3 (diam)		0.982	Spiral	1	9,940	6,030
Circular	3½ (diam)		1.146	½ In. Fins	10	7,450	5,520
Circular	3½ (diam)		1.146	1 In. Fins	10	10,320	7,626
Circular	3½ (diam)		1.146	1½ In. Fins	10	Failed combustion	

greater heat output than the rectangular shaped tubes. However, if considered on the basis of the heating surface that could be employed for a given cooking area,* total heat outputs attainable with narrow rectangular shaped tubes would be greater. As the rectangular shaped tubes were decreased to less than 1 in. in width, low input ratings were required for satisfactory combustion although a special burner adaptable to this shape of tube was utilized. Unsatisfactory combustion performance was obtained on the 1 in. diameter circular tube and the small rectangular tube even at very low input ratings. If tubes were individually fired, the 1 in. wide rectangular tube appeared to be the most satisfactory since it permitted use of input and output ratings equal to that of wider tubes, and since it permitted the use of much higher rates than could be utilized with narrower tubes.

2. Use of Baffles in Experimental Tubes

Studies were made with 3 types of baffles; namely disc baffles 3 in. apart, spiral baffles and longitudinal fin baffles welded to the tube wall. Results of these baffle studies are also included in Table 9. These data indicate that for the short length of tube involved, use of baffles apparently is not particularly effective. This result may be explained in part by the fact that unobstructed combustion space required was such a large percentage of tube volume that only a short length of baffle could be used. For example, the output of 2 in. diameter tube without baffles was comparable to that obtained when disc baffles were added. Efficiency was increased by the use of these baffles but it was necessary to decrease the input rate to permit complete combustion. The 3½ in. diameter tube with 1 in. wide fin type baffles gave a considerably higher heat output than the other tubes studied, but it would deliver much less heat than 2 rectangualr shaped tubes 1 in. wide and the latter would occupy much less lateral space in a fryer cooking compartment.

D. APPLICATION OF RESEARCH DATA IN DESIGN OF AN EXPERIMENTAL IMMERSION TUBE DEEP FAT FRYER

Results of research on optimum shape and baffling for short immersion tubes clearly indicated that the heating surface in deep fat fryers must be increased greatly beyond that of contemporary models to attain marked improvement in heating speed with high thermal efficiency. To determine the possibilities in this direction, a deep fat fryer was designed as shown in Figs. 26 and 27. Deep narrow tubes were selected in order to provide a large heating surface and accessability for cleaning. A single burner with vertical ports with a combustion chamber at one end of the tubes was chosen since it would be more readily adaptable to automatic control with a single pilot and would not be subject to as much difficulty from the standpoint of completeness of combustion. This had been found by experience to represent an inherent characteristic of narrow tubes

Table 10—Comparative Performance of Experimental Deep Fat Fryer and Representative Commercial Model

Fryer	Gas Input Rating Btu Per Hr			Stack Height In.	Flue Gas Temp. °F	Thermal Efficiency %	Heating Speed °F Min
	Total	Per Lb of Oil	Per Lb of Oil Above Tubes				
Experimental	50,000	1,390	2,460	24	500	62.7	24.1
No. 1	32,850	814	1,630	6	700	60.0	19.3
No. 1	62,650	1,550	3,112	72	1,095	44.8	25.8

---

*That is, for a given width of fryer, the number of 1 in. wide tubes which could be utilized would obviously be greater than the number of 2 in. diameter tubes which could be installed.

fired directly with individual burners. Likewise this type of burner application gave quieter operation than that obtained with the flame directed into tubes.

Heating speed and thermal efficiency obtained on this experimental unit are compared in Table 10 with fryer No. 1 which had the highest heating speed of any of the commercial units studied. It will be noted that comparative data for fryer No. 1 is given at two extreme input ratings. At the lower rating the efficiency approached that of the experimental unit while at the maximum rating approximately equal heating speed was obtained. On the basis of equal thermal efficiency, the experimental unit showed a much higher heating speed. Similarly, at equal heating speeds the experimental unit was far more efficient. This efficiency was attained without the use of any insulation and unquestionably could be increased by insulating the exposed side of the combustion chamber.

The experimental unit had a greater oil capacity particularly above the tubes. This is reflected in the comparative input rates per lb of oil included in Table 10 and makes the contrast in performance even more striking at equivalent heating speeds.

In order to determine whether the concentration of the flame in one compartment might cause an excessive differential between metal and oil temperatures, a thermocouple was brazed to the center of the top surface above the burner and temperature at this point and oil temperatures ½ in. below top center and ½ in. above the bottom of the crumb receptacle were obtained at 1-minute intervals during the heating-up period. Results presented graphically in Fig. 37 show that performance was entirely satisfactory both as to temperature differential between metal and oil and between top and bottom oil temperatures according to American Standard Approval Requirements for Hotel and Restaurant Deep Fat Fryers.

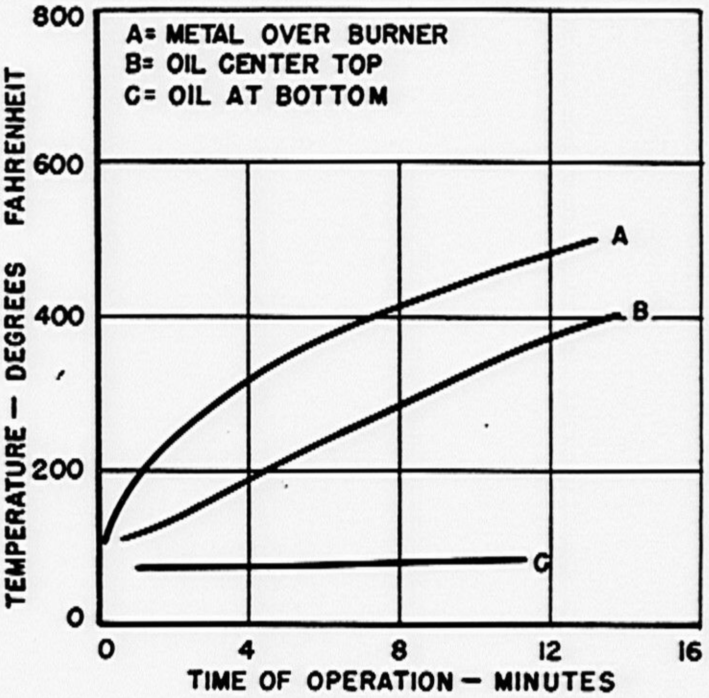

Fig. 37—Oil and Metal Temperatures in Experimental Model Deep Fat Fryer During Heating Up Period.

It is not intended to convey the thought that the design of the experimental unit is the only one that will give improved preheating speed and thermal efficiency results. Rather, this unit was built to demonstrate the improvement in performance that may be gained by employing larger heating surface areas.

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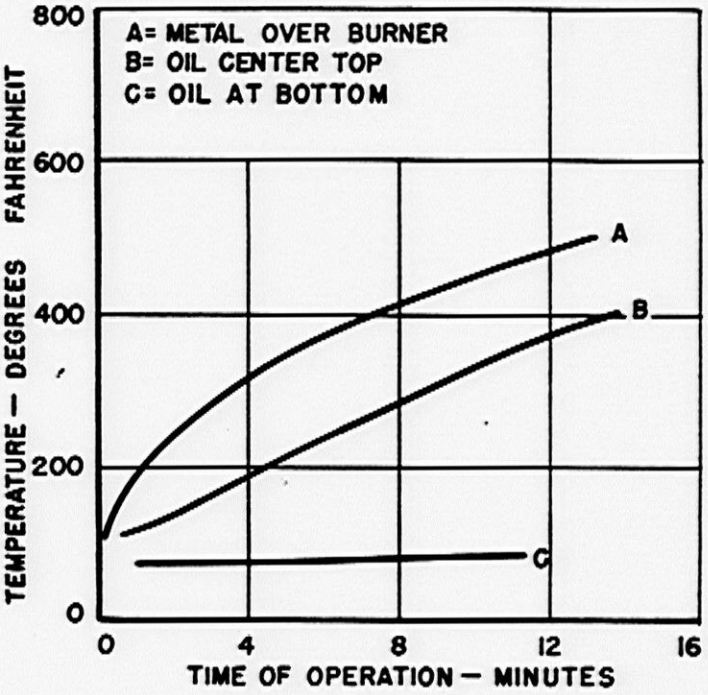

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PLAINTIFF'S EXHIBIT NO. 7-B.

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Design Studies of Gas Deep Fat Fryers

Research Bulletin Number 66

Project IA-1

A Study of Various Methods of
Heat Application to Commercial Equipment
(Gas Deep Fat Fryers)

Sponsored by

AMERICAN GAS ASSOCIATION
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COMMERCIAL GAS RESEARCH

Experimental work by: J. C. Anthony; R. A. Siskin;
L. V. Cachat; and R. L. Stone

Authors: R. A. Siskin; L. V. Cachat; and R. L. Stone

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* Technical Advisor for Project IA-1

American Gas Association Laboratories

Research Bulletin No. 66

DESIGN STUDIES OF GAS DEEP FAT FRYERS

ABSTRACT

A practical and theoretical analysis of all factors affecting gas deep fat fryer performance was made, to permit development of a prototype model having greater frying capacity and improved heat utilization. Validity and usefulness of these studies was established by construction of a fryer kettle capable of completely frying over 70 pounds of raw potatoes per hour in 32 pounds of fat at a burner input of 70,000 Btu per hour.

Fat deterioration studies aided development of this improved fryer by showing that local kettle wall temperatures up to 650F were not necessarily detrimental to fat. It was observed that frying of foods tended to reduce these hot spot temperatures. Fat deterioration in fryers used steadily for heavy-duty cooking was found to be mainly caused by the hydrolysis reaction with water evolved from foods during frying.

The major obstacle to improved gas fryer performance was found to be the difficulty of transferring sufficient heat from gases to the small kettle surface area. Extended surfaces or fins on the gas side of fry kettle walls were found to provide a satisfactory method of obtaining augmented area. The fat side resistance to heat flow was found to be relatively unimportant.

Heat absorption studies of french fried potatoes yielded a method of calculating their heat requirement as roughly 600 Btu per raw pound. Cyclic analysis of repeated batch frying provided a technique for evaluating fryers from both food heat and burner heat utilization measurements.

Shape and design features of natural and forced fat circulation fryer kettles were studied to develop effective crumb removal methods.

Alignment charts were developed to simplify analysis of fryer cyclic performance, efficiency vs. surface area, and heating speed. A chart is given for flue losses with natural, manufactured, propane and butane gases.

This research investigation by the American Gas Association Laboratories designated as Project IA-1, "A Study of Various Methods of Heat Application to Commercial Equipment (Gas Deep Fat Fryers)", was a PAR PLAN activity sponsored by the Association's Industrial and Commercial Gas Research Committee.

May, 1952

I. HISTORY AND OBJECTIVES

Over a period of years, popularity of foods prepared by deep fat frying methods has grown considerably. A great deal of this increased popularity may be traced to constant improvements made in gas deep fat fryers. In recent years, however, there has been evidenced an increasing demand for deep fat fryers with faster cooking and recovery speeds. This demand has been sharpened by the competition from electric appliance manufacturers who claim superior speed for their equipment.

In attempting to meet this challenge for increased cooking speed, it is apparent that any improvement must be obtained without causing detrimental effects on the life of the cooking medium, life of the kettle, and life of the appliance in general. These problems were not readily solved because basic information on many important design factors had not been generally available.

In order to provide the gas industry with helpful information for the development of gas fryers with increased speed characteristics, it was proposed that the basic fundamentals of gas deep fat fryer design be developed and made available to gas appliance manufacturers and the gas industry in general. The Committee on Industrial and Commercial Gas Research of the American Gas Association sponsored this proposed research as a PAR Plan Activity and assigned the project to the American Gas Association Laboratories as Project IA-1, "Study of Various Methods of Heat Application to Contemporary Commercial Cooking Equipment", with deep fat fryers as the first item to be considered.

The general purpose and objectives of this project are:

1. Development and interpretation of fundamental technical information on the design and construction of gas deep fat fryers leading to improved or optimum performance.
2. To make this information fully available to all gas companies and appliance manufacturers.

The scope of work performed under this investigation consisted of an engineering analysis and evaluation of the numerous factors involved in deep fat fryer design, performance, and operation; to find the limits of each factor and a basis on which optimum designs of fryers could be developed.

This bulletin presents the salient features of all work undertaken in the course of these studies. This includes the results of a literature and questionnaire survey on properties of commercial fats and oils. Also included are the pertinent parts of a study on theoretical factors in the improvement of gas deep fat fryers, as well as new results of studies and tests of experimental deep fat frying equipment.

PLAINTIFF'S EXHIBIT NO. 9.

Filed October 26, 1956.

Ratios of Combustion Space to Cooking Area and Heat-Transfer Surfaces on Various Sized Keating Fryers.

Model	Combustion Space to Cooking Area	Combustion Space to Tube Surface Area
10″ x 10″	2.6 to 1	1 to 1 (approx.)
14″ x 14″	2.80 to 1	1 to 1 "
18″ x 18″	2.91 to 1	1 to 1 "
20″ x 20″	2.62 to 1	1 to 1 "
24″ x 24″	2.73 to 1	1 to 1 "

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1,630,309

May 31, 1927.

A. R. PITMAN

FRYING APPARATUS

Filed Dec. 18, 1926

Fig. 1.

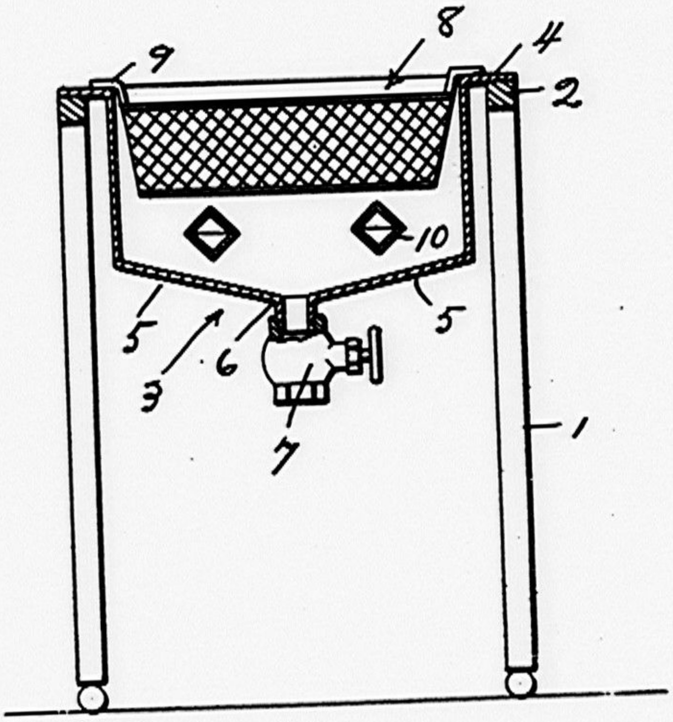


Fig. 2.

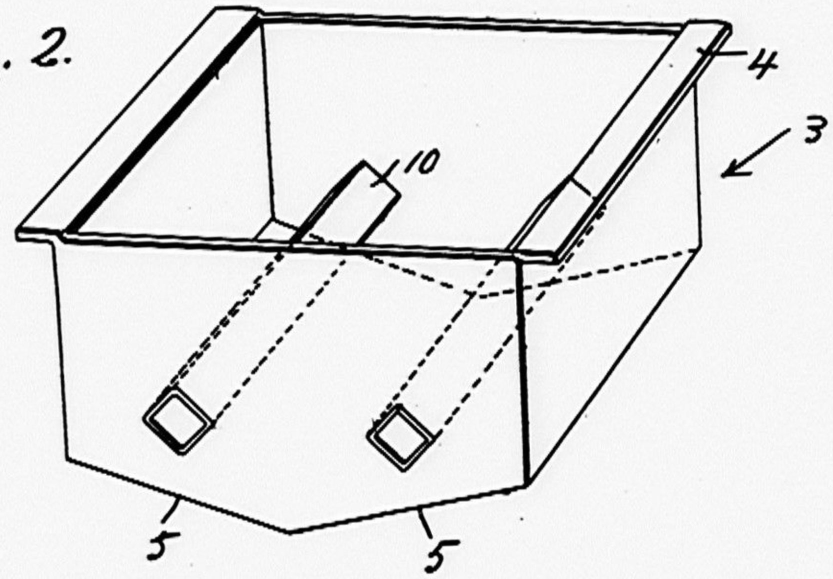
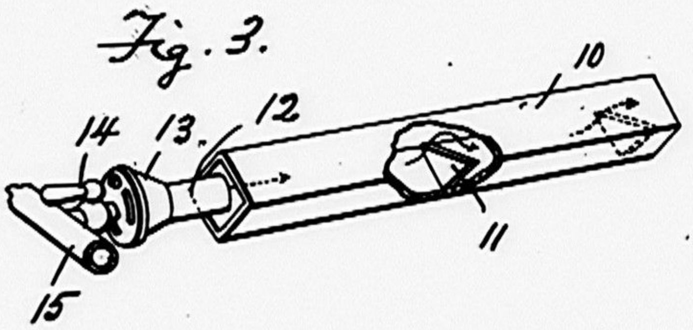


Fig. 3.



Inventor

Arthur R. Pitman.

By Clarence A. O'Brien Attorney

Patented May 31, 1927. 145 **1,630,309**

UNITED STATES PATENT OFFICE.

ARTHUR R. PITMAN, OF LYNN, MASSACHUSETTS.

FRYING APPARATUS.

Application filed December 18, 1926. Serial No. 155,659.

This invention relates to an improved apparatus for use in bakeries, lunch rooms, and kitchens, for frying doughnuts, potatoes, oysters, etc.

Briefly, the invention has reference to a suitable support, a hot grease kettle or container supported thereon, and a wire basket supported on the kettle and depending into the same and constructed to accommodate the food being treated.

My principal aim is to generally improve upon structures of this class by providing one of exceptional simplicity and durability, which includes, as one feature, a drain for the grease container, and which also includes a novel means for heating the grease in such container.

Other features and advantages of the invention will become apparent from the following description and drawings.

In the accompanying drawings forming a part of this application, and in which like numerals are employed to designate parts throughout the same:—

Figure 1 is a view in section and elevation of the complete structure.

Fig. 2 is a perspective view of the grease container.

Fig. 3 is a perspective view of one of the heating elements and of fuel supply devices therefor.

Referring to the drawing, in detail, it will be seen that the supporting structure comprises legs 1 connected together at their upper ends by cross pieces 2. Supporting on the latter, is a metal box-like container 3 for the grease. The end walls of this container are provided with horizontal supporting flanges 4 which rest on the top pieces 2. The bottom of the container includes downwardly and inwardly inclined bottom portions 5, at the juncture of which is a depending grease discharge neck or drain 6 with which a control valve 7 is connected.

Supported in the container is a wire mesh basket 8 adapted to contain the food particles, and this basket is provided with appropriate supporting brackets or hangers 9 resting upon the flanges 4.

Supported within the casing are heating elements each of which includes a substantially rectangular hollow tube 10 extending through the opposite side walls of the container. This tube is provided on its interior with the baffle plates 11 for distribution of the heat particles passing therethrough. As shown in Fig. 3, a gas burner 12 projects into one end of the tube and is provided with a mixing device 13, a control valve 14, and a gas conducting and supply manifold 15.

It is of course understood that the heat may be derived from some other source rather than the gas. For instance, an electrical resistance element (not shown) might be substituted.

In practice it is obvious that the grease is placed in a metal container, and the heating elements are made hot to in turn boil the grease. Then the basket containing the food particles is set in place and said articles are fried in a well known manner.

The undesirable grease can be drained thru the discharge means and through a suitable conducting pipe (not shown) to any suitable source of deposit.

By considering the description in connection with the drawings, a clear understanding of the invention will be had. Therefore, a more lengthy description is thought unnecessary.

Minor changes coming within the field of invention claimed may be resorted to if desired.

Having thus described my invention, what I claim as new is:—

1. In a structure of the class described, a support, a grease container of box-like form having outstanding supporting flanges, inclined bottom portions and a valved drain at the center of the bottom, together with tubes extending across the interior of the container, adapted to receive suitable heating means, said tubes being provided with longitudinally spaced internal baffles for distribution of the heat.

2. In a baffle of the class described, a support, a box-like grease container provided with a valved drain at its bottom, provided with internal hollow tubes adapted for reception of heat means, said container being provided with outstanding supporting flanges to rest on said support, and a wire basket fitted into said container and provided with hangers adapted to rest on said flanges.

In testimony whereof I affix my signature.

ARTHUR R. PITMAN.

147

Oct. 24, 1939. **K. L. CHILDS** 2,176,869

FRYING APPARATUS

Filed July 6, 1936 2 Sheets-Sheet 1

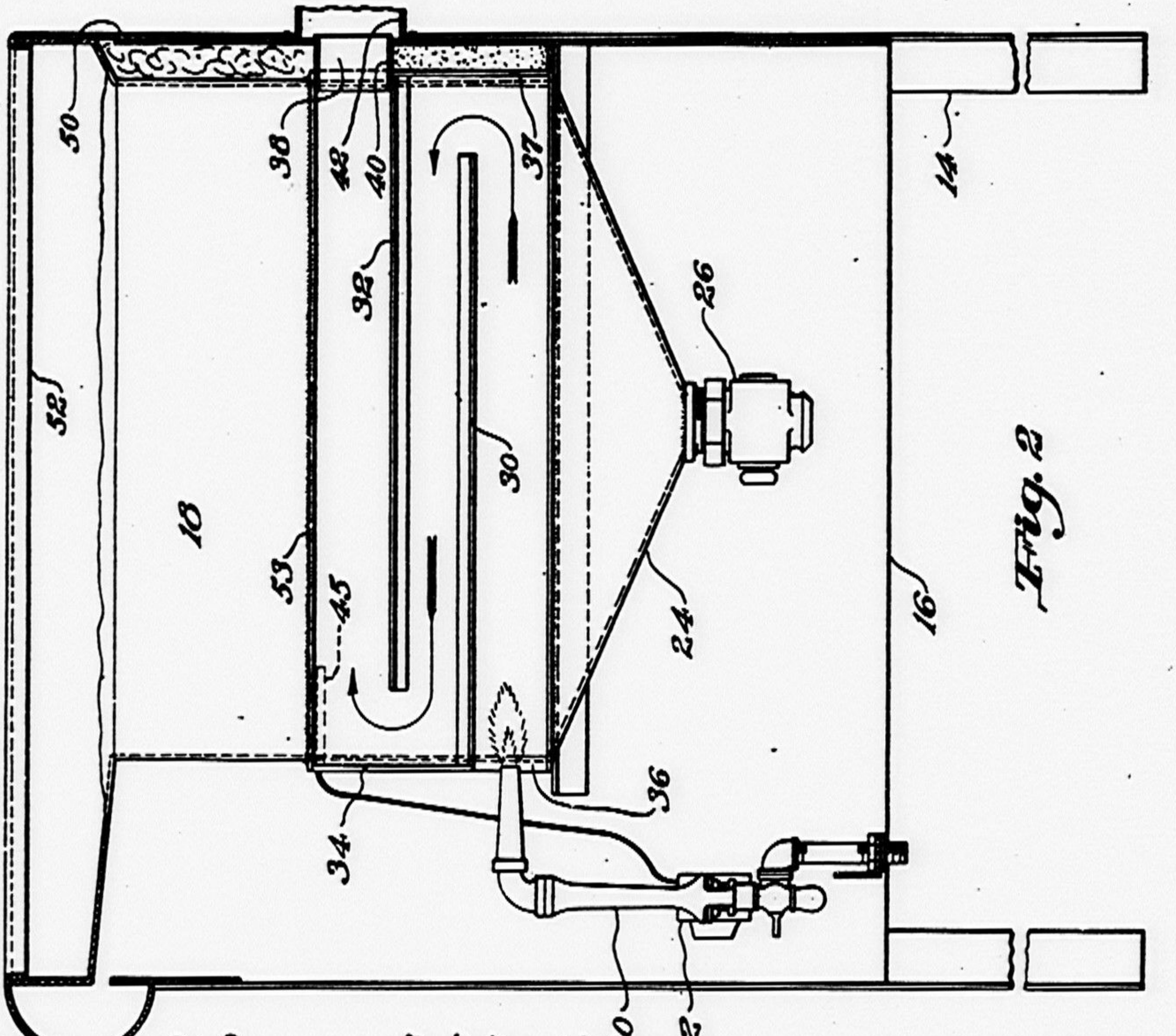


Fig. 2

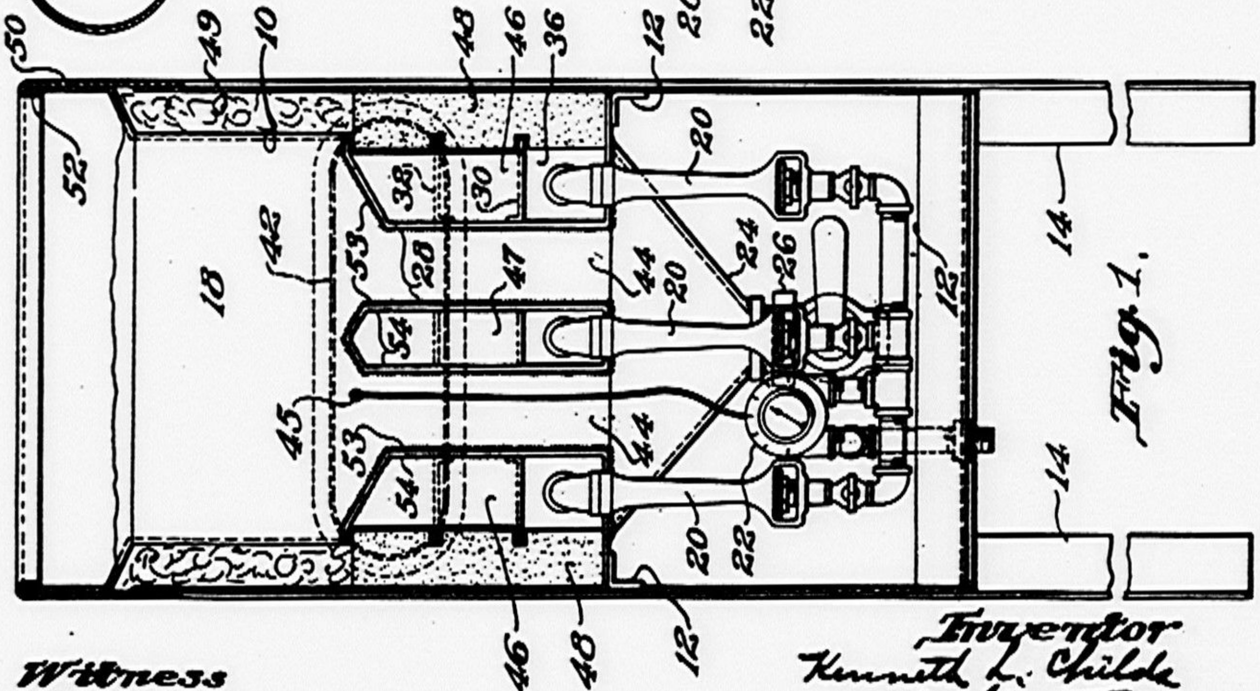


Fig. 1.

Witness
Paul F. Bryant

Inventor
Kenneth L. Childs
by his attorneys
Fish, Hildreth, Cary & Jenney.

149

Oct. 24, 1939. K. L. CHILDS 2,176,869

FRYING APPARATUS

Filed July 6, 1936 2 Sheets-Sheet 2

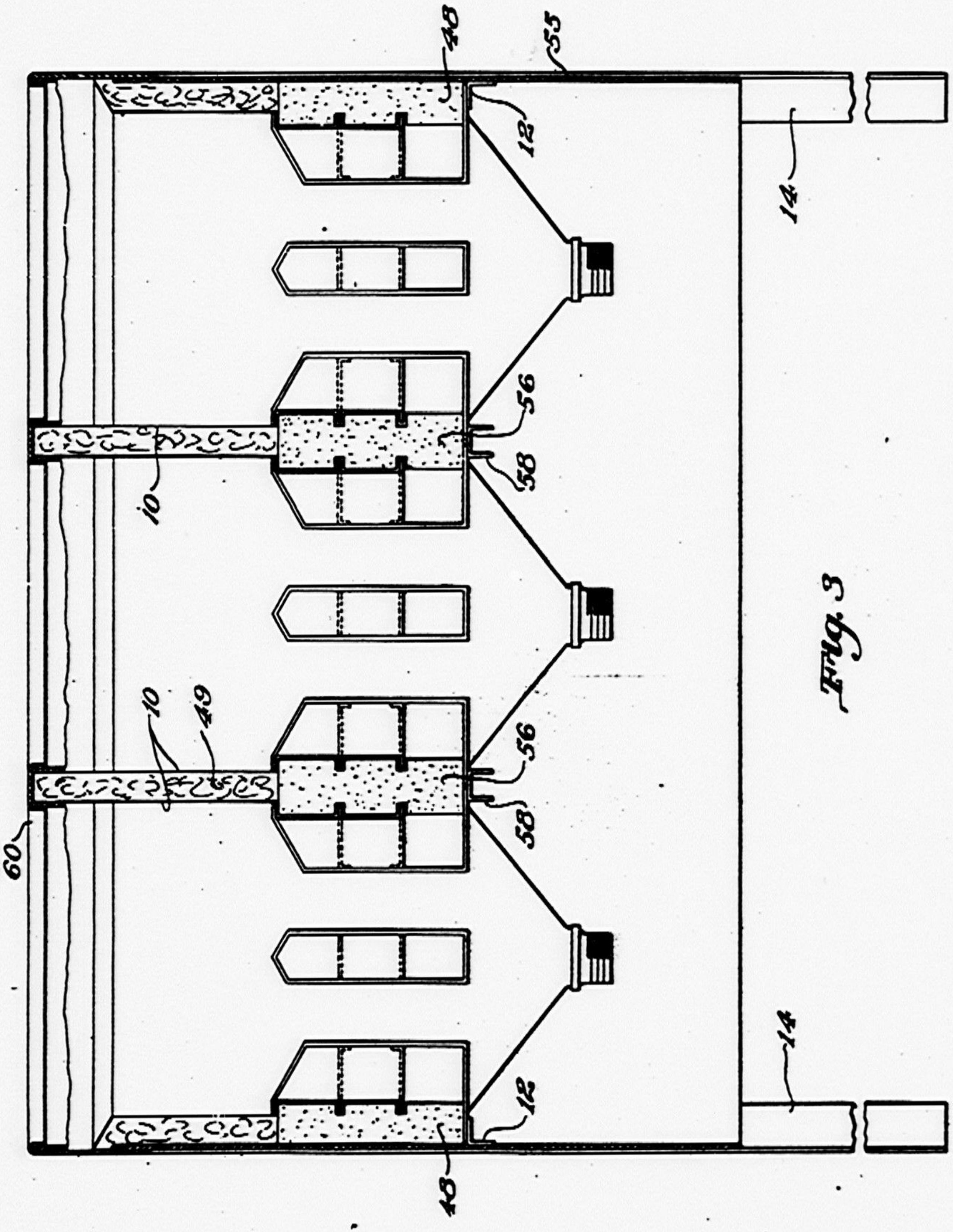


Fig. 3

Witness
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Kenneth L. Childs
by his attorneys
Fish, Hildreth, Cary & Jenney

Patented Oct. 24, 1939

2,176,869
151

UNITED STATES PATENT OFFICE

2,176,869

FRYING APPARATUS

Kenneth L. Childs, New Haven, Conn.

Application July 6, 1936, Serial No. 88,963

3 Claims. (Cl. 53—7)

The present invention relates to frying apparatus, and more particularly to improvements in kettles heated by combustion for maintaining a supply of fat, oil, or other liquid at a suitable cooking temperature.

An object of the invention is to provide a novel and improved fat or other liquid containing kettle which may be heated by combustion with less consumption of fuel, and which may be maintained at a more even temperature than heretofore without the difficulties normally accompanying such heating. Another object of the invention is to improve the construction of a kettle of this type, together with its supporting means in which the parts are manufactured from materials of relatively low cost and assembled easily. A further object is to provide a novel and improved construction for apparatus of this nature having a number of fat or other liquid containing kettles provided in a single unitary assemblage.

It is the usual practice in heating liquid-containing kettles by combustion to direct a flame through the side walls of a kettle by means of an ordinary metal pipe of circular cross-section properly vented at its end remote from the point where the flame enters. Unless the pipe passes completely through both sides of the kettle, threaded joints and pipe fittings of suitable construction to make the necessary bends are required. If the pipe passes completely through the kettle, the heated gases of combustion are not sufficiently reduced in temperature to provide efficient heating. The use of threaded joints and pipe fittings also is undesirable due to possible fat leakage, and to difficulties in cleaning the crevices and confined angular spaces formed in the kettle at the joints of the fittings.

In order to avoid these difficulties, the present invention contemplates the provision of a kettle mounted in a supporting casing and constructed with a combustion chamber within the lower portion of the kettle having elongated heating passages, certain of the confining walls or partitions of which are common to each other throughout the length of the passages and other walls of which are exposed to the interior of the kettle throughout the lengths of the passages. With this arrangement, substantially all of the heat from the gases of combustion is subtracted while the construction of the outer chamber walls exposed to the interior of the kettle is of regular contour without bends and with a minimum of external confined crevices which present difficulties in cleaning or in the proper circulation of the fat or other liquid within the kettle. The partitions preferably are horizontal so as to divide the space in the combustion chamber into a vertical tier of passages. With the construction as illustrated in the drawings, the inlet to the combustion chamber is at one side of the kettle and the outlet is at the other side, the partitions being so arranged that the passages lead from one to another in a series between the inlet and outlet.

In order to provide working space through which the bottom of the kettle may be cleaned, according to another feature of the invention, the kettle is constructed and arranged with reentrant sides partially enclosing the combustion chambers while the area between the combustion chambers in the kettle is left open. With this construction, the combustion chambers are closed at the sides of the kettle by suitable insulating barriers. To increase rapidly the temperature of a large kettle, as when bringing the fat to the cooking point, in connection with this feature of the invention, a central combustion chamber, the side walls of which are entirely surrounded by the fat in the kettle is located between the combustion chambers at the sides of the kettle while leaving sufficient space between the several chambers for convenient cleaning.

To simplify the construction and reduce the outside dimensions of the kettle in the apparatus as disclosed, the kettle is constructed with a generally rectangular shape and the passages of the combustion chamber are also rectangular in cross-section with side walls exposed to the interior of the kettle arranged vertically. By making the kettle and the passages of rectangular section, partitions may be of flat plane sheet metal and the heat from burning gases along one section of the passage will be partly transferred through the partitions to improve the combustion effect in the adjacent passages.

Other features of the invention including certain details of construction and combinations of parts are hereinafter described in the following detailed specification and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a view in front elevation, partly broken away and shown in section of apparatus embodying the features of the present invention; Figure 2 is a view, in side elevation similarly broken away and shown in section, of the apparatus illustrated in Figure 1; and Figure 3 is a view similar to that shown in Figure 1, of apparatus including a number of kettles arranged in the form of a battery.

The apparatus illustrated in the drawings is a

To provide an integral covering for the space between the sides of the kettle 10 and the casing, the upper part of the kettle above the cooking space 18 is enlarged so that the upper edges of the kettle extend above in substantial alignment with the edge portions of the enclosure 16, and the entire kettle is surrounded by an apron 50 overlapping the edges of the kettle and enclosure. The upper part of the apron is flanged and reversely bent at 52 so as to extend downwardly into the interior of the kettle.

To enable the parts of the kettle to be joined together conveniently and with a minimum possibility of leakage, the walls 28 of each combustion chamber are arranged to extend entirely through opposite sides of the kettle with the edges projecting beyond the sides of the kettle. The angle formed by the projecting edges of each combustion chamber wall and the adjacent kettle side provides convenient surfaces for welding a tight seam, indicated at 53. The end plates 34 are then attached at the extreme edges of the combustion chamber wall by a similar welded seam 54 without affecting the security of the first seam 53.

When a number of kettles are to be employed in the form of a battery, as when treating articles successively at different temperatures, several kettles constructed in the manner just described may be supported in a casing 55 (see Fig. 3) sufficiently large to surround them. Substantially all of the parts of the apparatus are duplicated in the case of each kettle except that the blocks 48 of insulating material are used only at the ends of the casing, and special blocks 56 having grooves on both sides are employed between adjacent kettles, each supported on a channel shaped frame member 58 which also acts to support the lower edges of the corresponding kettles. The upper edges of the kettles are protected by an apron 60 having a flanged opening for each kettle, the edges of which flanged opening are bent downwardly into the kettles. Other parts of the battery construction are substantially the same except that the upper parts at adjacent sides of the kettles are straight and the entire space between them packed with the heat insulating material 48.

The invention having been specifically described, what is claimed is:

1. Frying apparatus having, in combination, a casing comprising an inner frame, and a side enclosure, a battery of kettles of generally rectangular shape in said casing, each resting at its lower portion on the frame inside the casing, combustion chambers each having one vertical side wall exposed to the interior of a kettle, a heat insulating barrier supported on the frame of the casing to form the other side wall of a combustion chamber and to prevent the heat of one kettle from affecting an adjacent kettle, and one or more horizontal partitions in each combustion chamber having their opposite edges attached to said first mentioned side wall and embedded in the heat insulating barrier respectively for dividing the combustion spaces of each chamber into a series of elongated passages.

2. Frying apparatus having, in combination, a kettle, and one or more combustion chambers in the form of horizontal elongated passages, each surrounded in part by a reentrant side portion of the kettle, and in part by a barrier of heat insulating material closing the reentrant side portion.

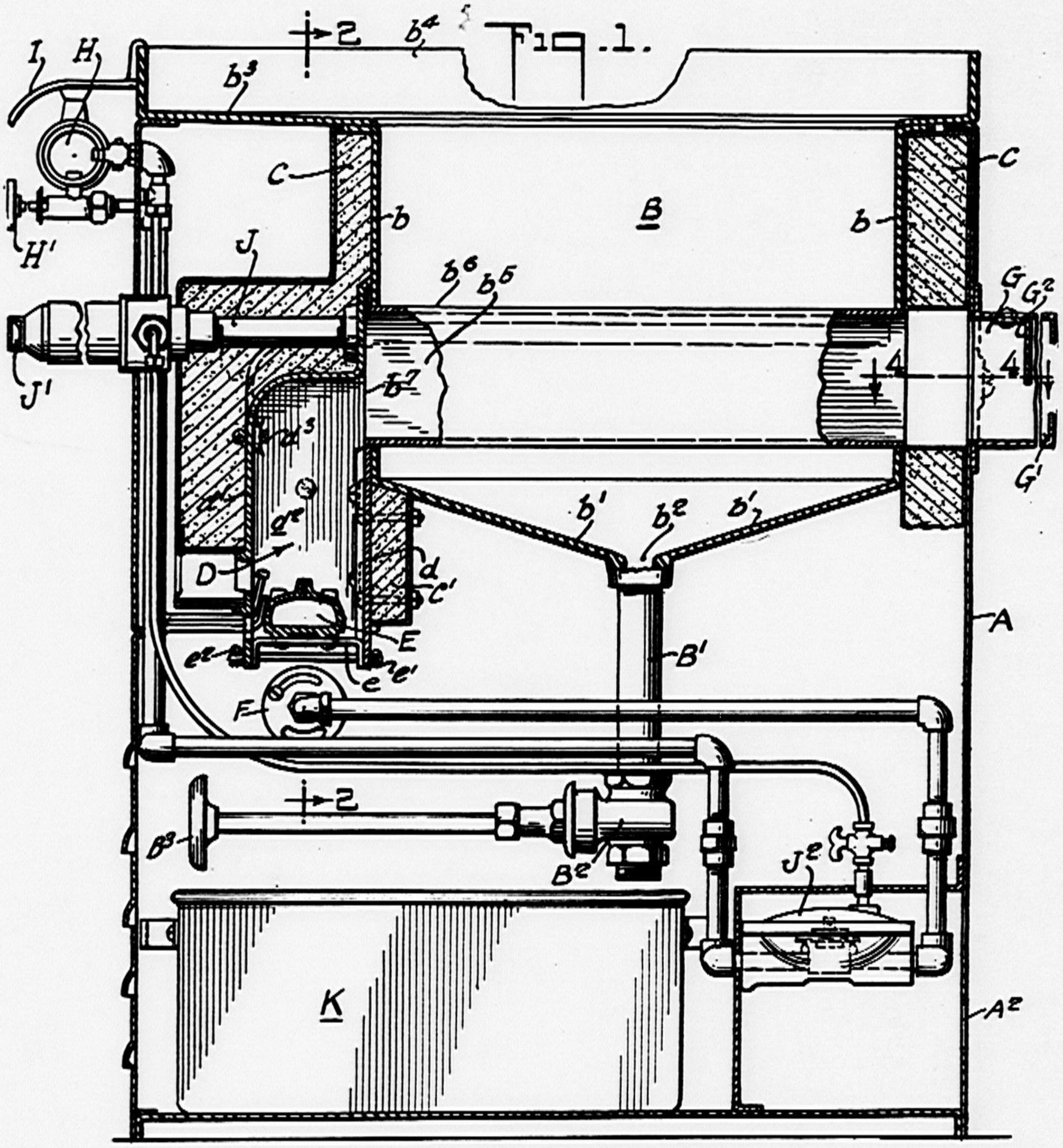
3. Frying apparatus having, in combination, a kettle having one or more reentrant side portions and one or more horizontally elongated combustion chambers formed by the reentrant side portions of the kettle, and a central elongated combustion chamber in the kettle between, but suitably spaced from the reentrant side portions of the kettle, with its sides, top and under surfaces exposed to the interior of the kettle.

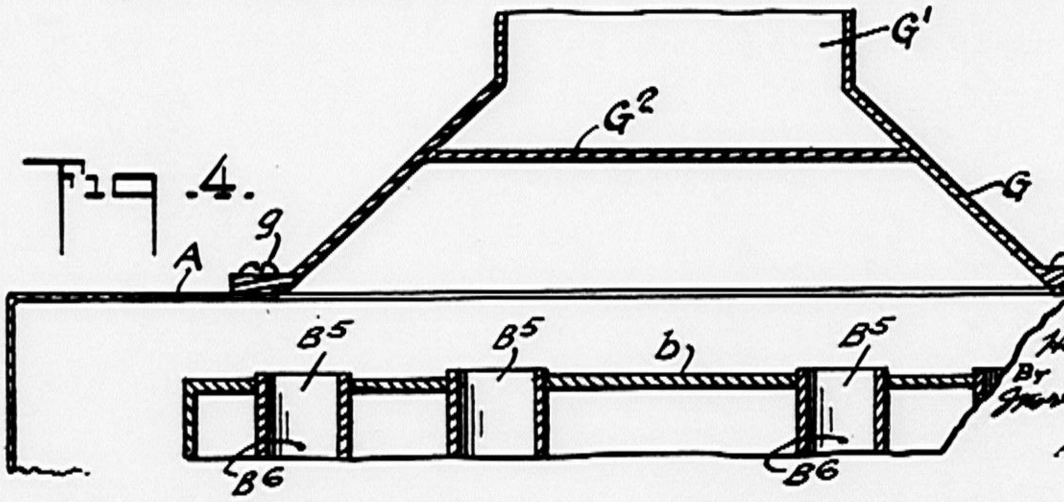
KENNETH L. CHILDS.

Dec. 5, 1939. **H. W. O'DOWD** **2,182,735**

LIQUID HEATING APPARATUS

Filed Dec. 18, 1936 5 Sheets-Sheet 1





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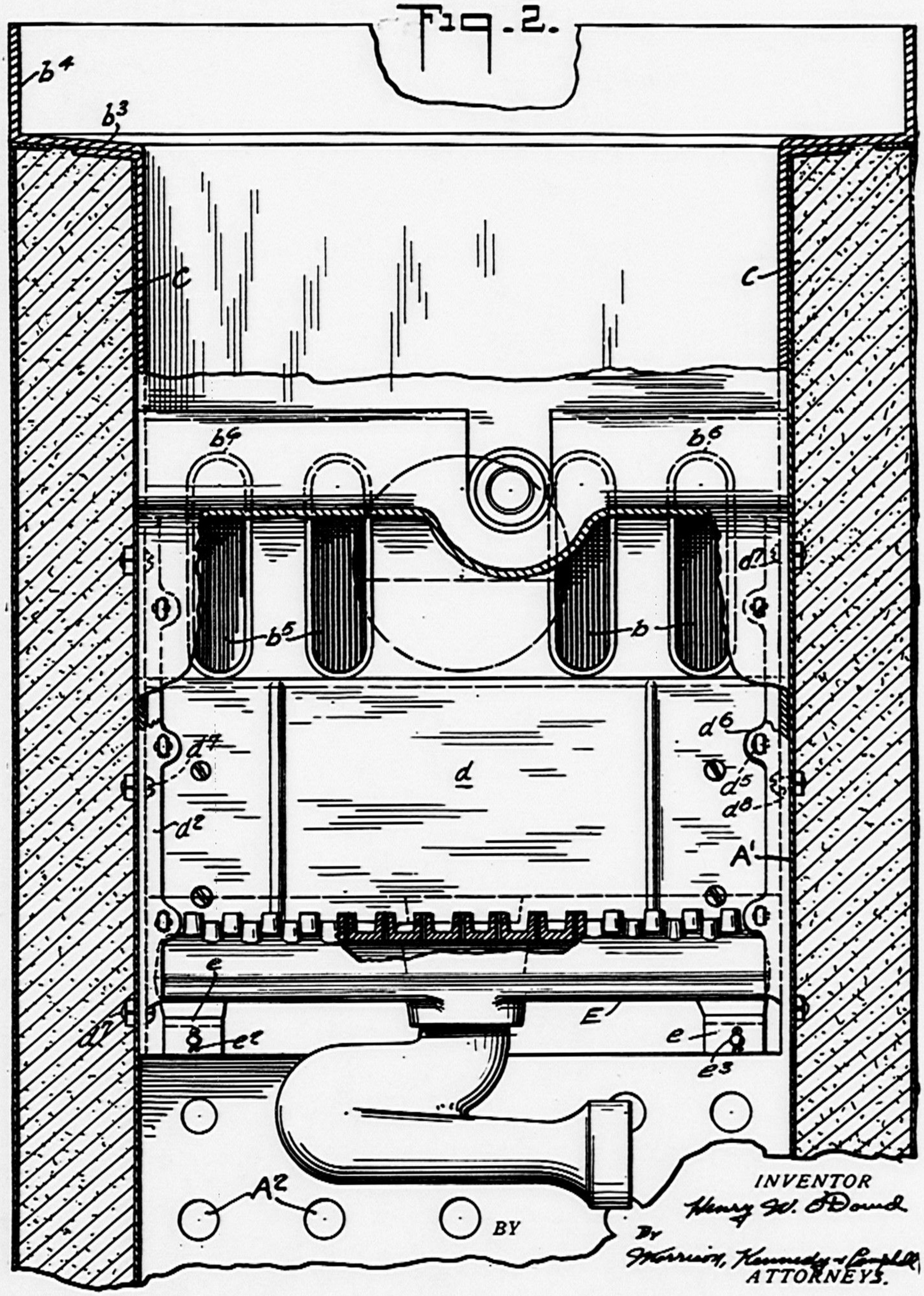
LIQUID HEATING APPARATUS

Filed Dec. 18, 1936 5 Sheets-Sheet 2

Fig. 2.



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LIQUID HEATING APPARATUS

Filed Dec. 18, 1936 5 Sheets-Sheet 3

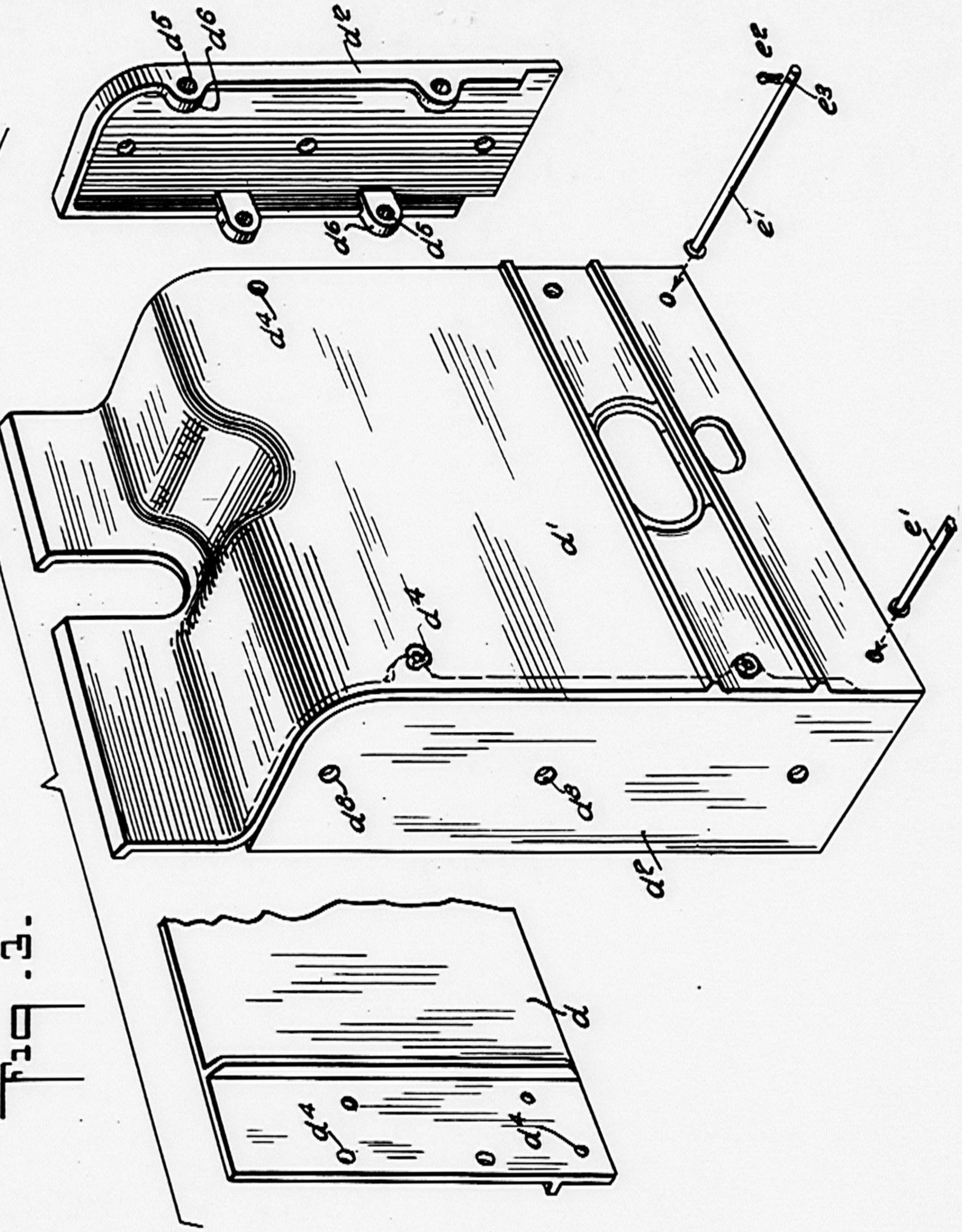

Fig. 3.

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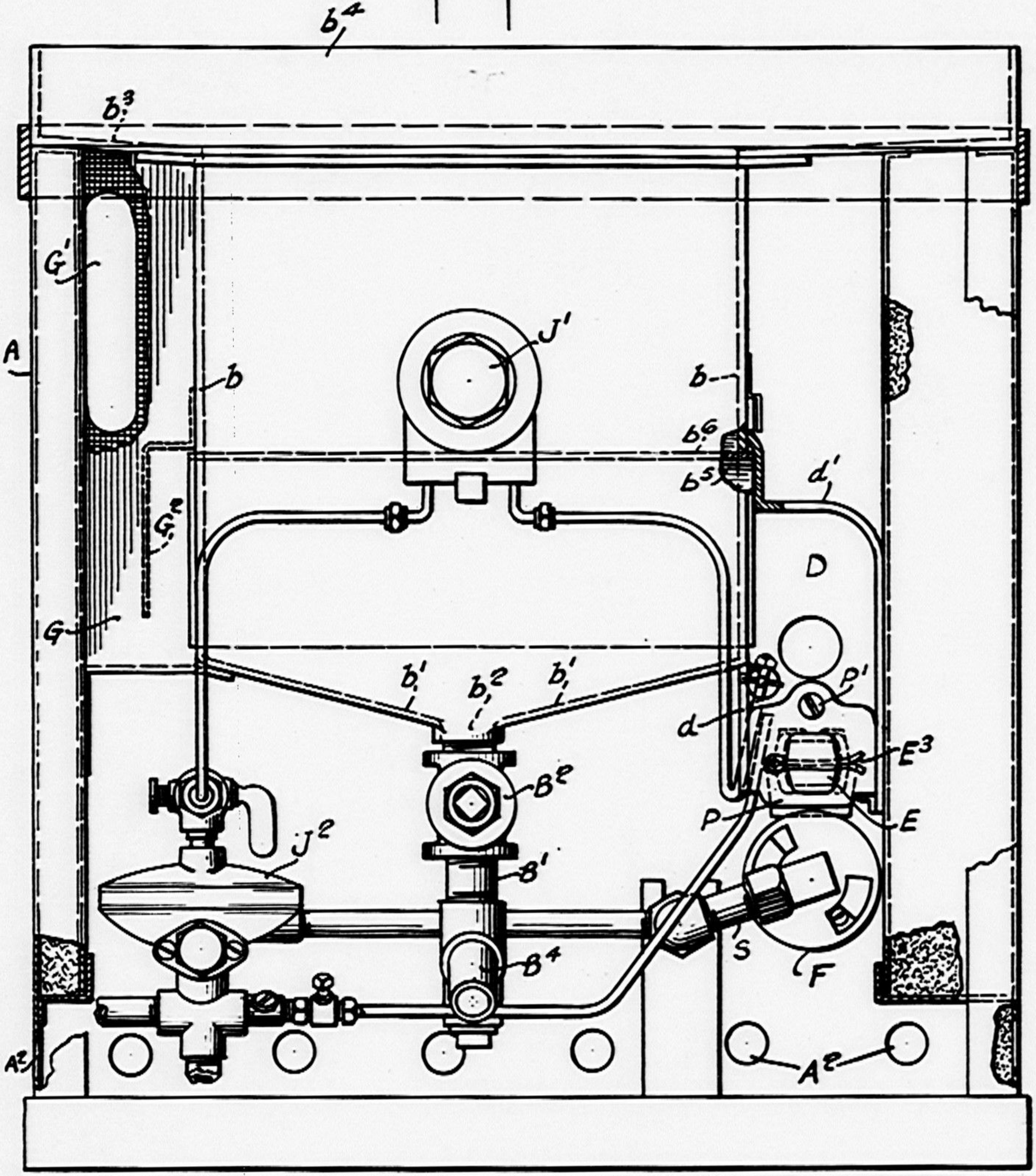
LIQUID HEATING APPARATUS

Filed Dec. 18, 1936 5 Sheets-Sheet 4

Fig. 5.



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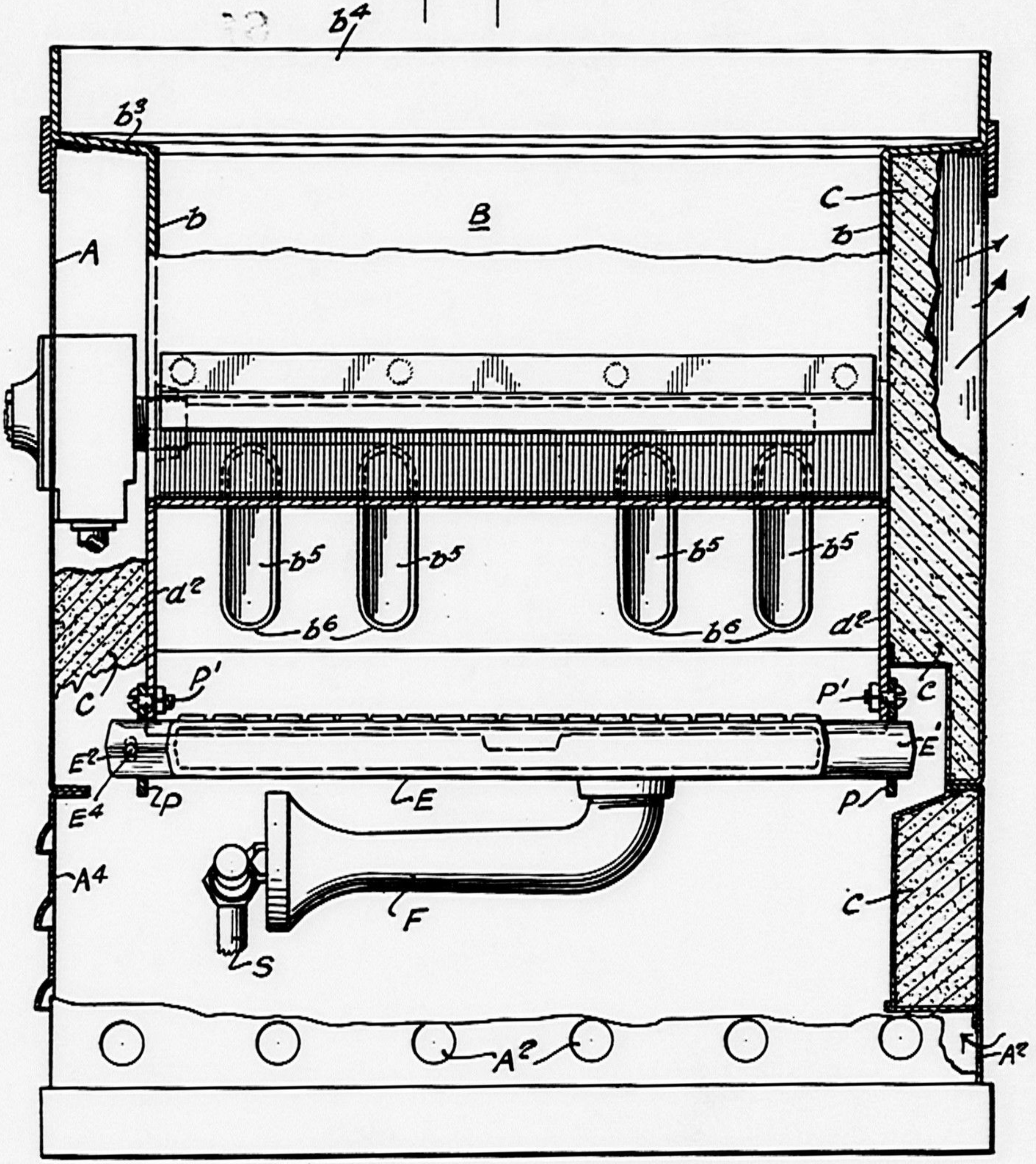
Dec. 5, 1939. **H. W. O'DOWD** **2,182,735**

LIQUID HEATING APPARATUS

Filed Dec. 18, 1936 5 Sheets-Sheet 5

Fig. 6.



INVENTOR

Henry W. O'Dowd

BY Morrison, Kennedy & Campbell

ATTORNEYS.

UNITED STATES PATENT OFFICE

2,182,735

LIQUID HEATING APPARATUS

Henry W. O'Dowd, Jersey City, N. J., assignor to Standard Gas Equipment Corporation, a corporation of Maryland

Application December 18, 1936, Serial No. 116,518

7 Claims. (Cl. 53—7)

This invention relates to liquid heating apparatus, more particularly of the gas fired variety, and though adapted for general application, is intended especially for cooking purposes, such as deep fat frying.

The object of the invention is to obviate objectionable features of existing liquid heating apparatus, chief among which are waste of fuel and cooking liquid (cooking fat or oil) and impairment of the taste and color of the food cooked. These objectionable features arise from the heating of the cooking liquid by the application of the burner flame directly to the vessel or a portion thereof in immediate contact with the liquid contained therein. Fuel is wasted by the failure to utilize the products of combustion to the fullest extent to heat the liquid and in maintaining at the desired temperature the upper region of the body of liquid wherein the cooking is done and which is remote from the source of heat. The liquid at the point where the heat is applied to the vessel becomes superheated and scorched, causing it to smoke and become discolored, the food in turn being discolored and rendered distasteful thereby, so that the liquid must be renewed frequently when otherwise it could be used for a much longer period. Moreover, particles of food which settle into the superheated region of the vessel carbonize and disintegrate and are carried with the liquid as it circulates throughout the vessel to the cooking area where they become deposited upon the food being cooked.

The present invention overcomes these and other objectionable features by providing means for heating the liquid in the vessel by heat transmitted from a Bunsen burner arranged in a closed combustion chamber so as to avoid impingement of the burner flames on the vessel. More specifically, according to the invention the vessel is equipped with a plurality of heating flues passing through the interior thereof from one side of the vessel to the opposite side and adapted to be surrounded by the liquid therein, the heating flues communicating at one end with the combustion chamber at a point remote from the burner therein, and at their opposite ends with a flue box into which the spent products of combustion are discharged and subsequently vented therefrom. The invention further provides an arrangement whereby the combustion chamber is insulated from the vessel and from the atmosphere to prevent scorching of the liquid and to conserve fuel; and means is arranged in the flue box at the discharge ends of the heating flues to obstruct and retard the passage of the heated products of combustion therethrough and permit a maximum amount of heat to be absorbed by the liquid before the products of combustion pass out through the chimney flue.

In the accompanying drawings, the invention is shown merely by way of example and in preferred form and obviously many variations and modifications thereof may be made which will still be comprised within its spirit. It should be understood, therefore, that the invention is not limited to any specific form or embodiment except insofar as such limitations are specified in the appended claims.

Referring to the drawings:

Fig. 1 is a fore and aft sectional elevation through the heating apparatus, some of the parts being broken away to show their construction;

Fig. 2 is a sectional elevation, some of the parts being broken away, taken on the line 2—2 of Fig. 1;

Fig. 3 is an exploded perspective view of the combustion chamber housing, some of the parts being broken away;

Fig. 4 is a sectional view, some of the parts being broken away, taken on the line 4—4 of Fig. 1, looking in the direction of the arrow;

Fig. 5 is a front sectional elevation, some of the parts being broken away, of a modification of the heating apparatus; and

Fig. 6 is a side sectional elevation, some of the parts being broken away, of the modification shown in Fig. 5.

In general, the heating apparatus is of the cabinet type enclosed except at the top by a casing A, which houses a liquid containing vessel B, insulated therefrom by suitable insulating material C, and a vertically disposed closed combustion chamber D in which a Bunsen burner E is arranged. The combustion chamber is common to horizontal heating flues b^5 communicating therewith and passing through the interior of the vessel B to a flue box G from which the products of combustion are vented through a discharge or chimney flue G^1. The burner E is supplied with gas from a manifold H under the control of a manually operable stop-cock H^1, the manifold and stop-cock being covered by a shield I which protects them from splattering grease and minimizes the danger of accidental operation of the stop-cock. The temperature of the liquid in the vessel is automatically controlled by a thermal couple J, which may be set to operate at the desired temperature by a manual control J^1 and which operates through a snap value J^2 to control the flow of gas to the burner E. In vessel B permits four flues to be employed and properly spaced apart so that the heat therefrom is uniformly distributed throughout the vessel and the flues and portions of the vessel beneath them are accessible for cleaning.

The relationship of the heating flues b^5 to the combustion chamber D is substantially the same as in the structure shown in Figs. 1 to 4, in that the flues communicate therewith through ports b^7 located at a level remote from the burner E in the lower part of the combustion chamber. As before, the combustion chamber is insulated from the atmosphere by insulating material C, but because a small burner E is employed and arranged nearer to the ports b^7, it is unnecessary to insulate the rear plate *d* of the combustion chamber from the bottom of the vessel B. The burner suspension, however, is modified and comprises two plates P, one bolted as at P^1 to each side wall d^2, formed with apertures through which the ends E^1 and E^2 of the burner E pass. The end E^1 of the burner is round and adapted to fit in a correspondingly shaped aperture formed in one plate P, while the end E^2 is formed non-circular in cross section and is adapted to fit in a correspondingly shaped aperture formed in the other plate to prevent the burner from twisting, a cotter pin E^3 being arranged in an opening E^4 in the end E^2 of the burner to prevent the latter from shifting to the right (Fig. 6) out of engagement with the main feed pipe S, which is provided as usual with a nozzle (not shown) projecting into the mixing chamber F of the burner. To remove the burner E, it is necessary merely to remove the cotter pin E^3 and shift the burner to the right (Fig. 6) to break the connection between the burner and the nozzle on the supply pipe S and to disengage the end E^2 of the burner from its supporting plate P, lower the end E^2 of the burner below the plate P and shift the burner to the left to withdraw the end E^1 from its supporting plate P. The steps are reversed, of course, to install the burner.

The flue box G (Fig. 5), arranged at the discharge ends of the flues b^5, covers the entire side *b* of the vessel, thus acting as a heating chamber for that side of the vessel which is remote from the burner, and exhausts through the chimney flue G^1 formed near the top of the wall of the flue box G at the rear of the apparatus. The baffle plate G^2, in this instance, is fastened to the wall *b* of the vessel at the discharge ends of the flues b^5 and is bent outwardly and downwardly to depend in spaced relation thereto to retard the issuance of the heated gases from the upper portions of the flues.

In order to reduce the height of the apparatus, no space is provided for a drain pan for drawing off used liquid and sediment from the vessel B. Provision is made, however, to facilitate draining the vessel by having a nozzle B^4 attached to the drain pipe B^1 and extending to the front of the apparatus where it is accessible through a door A^4 to drain into a receptacle placed or held below it.

Having thus described my invention what I claim is:

1. Deep fat frying apparatus comprising a vessel for containing liquid fat to be heated, a closed combustion chamber arranged exteriorly of and being insulated from the liquid containing vessel, a Bunsen burner arranged and operative to restrict the burner flames to the combustion chamber, and an open-ended heating flue having one end communicating with the combustion chamber in a zone beyond the burner flames and leading from the combustion chamber through the interior of the liquid containing vessel with its opposite end opening exteriorly of the vessel, whereby the liquid fat within the vessel is heated solely by the caloric currents emanating from the burner flames and circulating through the heating flue.

2. Deep fat frying apparatus comprising a vessel for containing liquid fat to be heated, a closed combustion chamber arranged exteriorly at the side of the liquid containing vessel and being insulated therefrom, a Bunsen burner arranged and operative to restrict the burner flames to the combustion chamber, a discharge flue arranged exteriorly at the side of the liquid containing vessel opposite the combustion chamber, and an open-ended heating flue having one end communicating with the combustion chamber in a zone beyond the burner flames and leading from the combustion chamber through the interior of the liquid containing vessel and opening into the discharge flue, whereby the liquid fat within the vessel is heated solely by the caloric currents emanating from the burner flames and circulating through the heating flue from the combustion chamber to the discharge flue.

3. Deep fat frying apparatus comprising a vessel for containing liquid fat to be heated, a vertically disposed closed combustion chamber arranged exteriorly of and being insulated from the liquid containing vessel, a Bunsen burner formed with upwardly directed flame ports arranged at the bottom of the combustion chamber and being operative to restrict the burner flames to the combustion chamber, and an open-ended heating flue having one end communicating with the combustion chamber at the extreme upper end thereof in a zone remote from the burner and beyond the burner flames, the flue leading from the combustion chamber through the interior of the liquid containing vessel and having its opposite end opening exteriorly of the vessel, whereby the liquid fat is heated solely by the caloric currents emanating from the burner flames and circulating through the heating flue.

4. Deep fat frying apparatus comprising a vessel for containing liquid fat to be heated, a closed combustion chamber arranged exteriorly of and being insulated from the liquid containing vessel, a Bunsen burner arranged and operative to restrict the burner flames to the combustion chamber, and a plurality of separate open-ended heating flues communicating each at one end with the combustion chamber in a zone beyond the burner flames and leading from the combustion chamber through the interior of the liquid containing vessel with its opposite end opening exteriorly of the vessel, whereby the liquid fat in the vessel is heated solely by the caloric currents emanating from the burner flames and circulating through the heating flues.

5. Deep fat frying apparatus according to claim 1, including means to retard the circulation of the caloric currents through the heating flue.

6. Deep fat frying apparatus according to claim 1, wherein the heating flue is arranged with its top wall above the level of the top of the combustion chamber and has the lower portion only of its end opening into the combustion chamber.

7. Deep fat frying apparatus according to claim 1, wherein the heating flue is formed within the vessel with a rounded exterior top surface to avoid the accumulation of sediment thereon.

HENRY W. O'DOWD.

Oct. 21, 1947. **E. L. KELLS** 2,429,360

DEEP FAT FRYER

Filed March 3, 1942

Fig. 1.

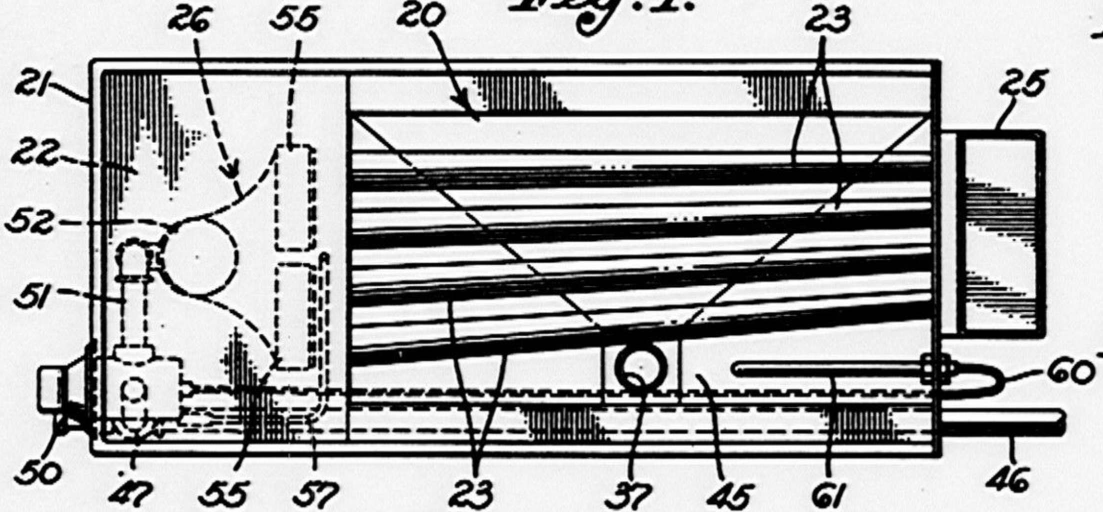


Fig. 7.

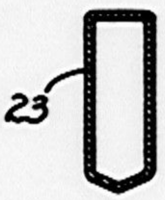


Fig. 8.

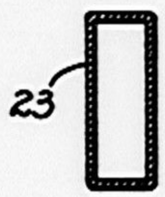


Fig. 2.

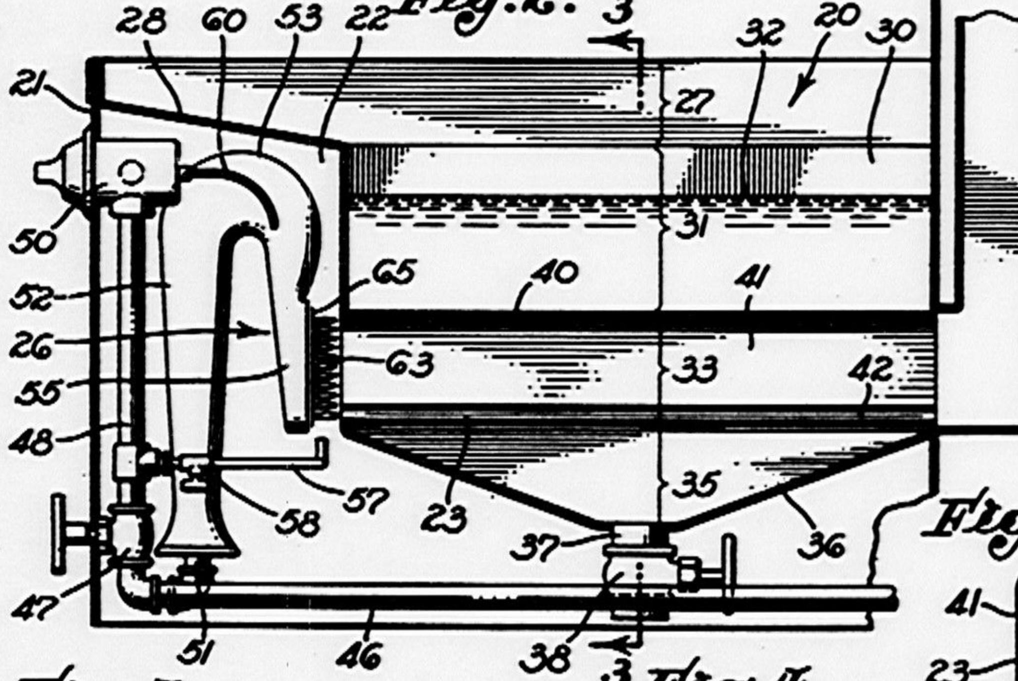


Fig. 9.

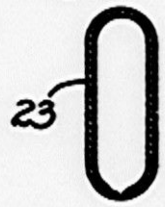


Fig. 10.

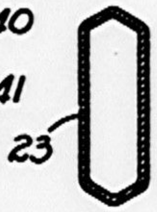


Fig. 6.

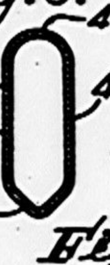


Fig. 3.

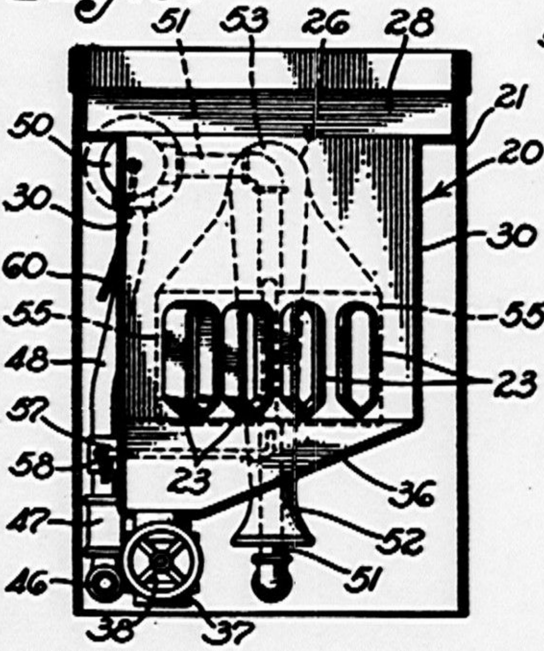


Fig. 4.

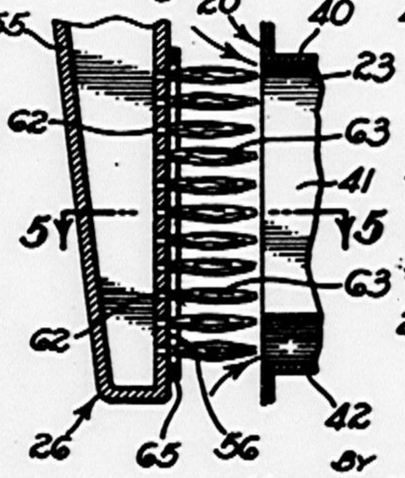
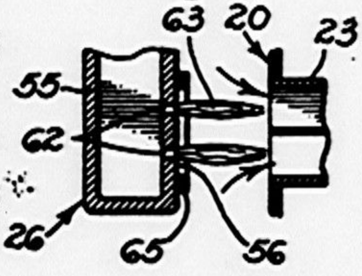


Fig. 5.



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Patented Oct. 21, 1947

2,429,360

171

UNITED STATES PATENT OFFICE

2,429,360

DEEP FAT FRYER

Edward L. Kells, Alhambra, Calif.

Application March 3, 1942, Serial No. 433,110

18 Claims. (Cl. 126—391)

The present invention relates to an improved deep fat fryer of the type employed in hotels, restaurants, and the like. A device of the general type to which the invention refers comprises a rectangular receptacle approximately 14'' long for a liquid cooking medium, the receptacle being provided with horizontal heat exchange passage means or tubes in combination with some type of gas burner. In the prevalent type of deep fat fryer, three cylindrical tubes approximately 2½'' in diameter are employed for heat transference.

The gas-fired deep fat fryers now manufactured and used are inefficient both with respect to heat transference and with respect to heat generation. In any attempt to achieve efficiency, economy, and simplicity in a deep fat fryer of this general type, numerous problems are encountered and the general purpose of my invention is to meet such problems effectively. These problems, which arise largely from the necessarily limited dimensions of a deep fat fryer, are reflected in the objects of my invention discussed below.

With reference to the receptacle for the cooking liquid and the design and arrangement of heat exchange tubes therein, my invention has the following objects: to provide a fryer requiring a low volume of cooking liquid both to minimize the mass to be heated and to minimize the cost of periodically replacing the liquid; to provide a receptacle and tube arrangement that is relatively simple in construction and relatively easy to clean; to provide relatively extensive areas for heat exchange; to achieve a low heating load per unit area and to do so without the necessity of employing a correspondingly large volume of liquid; to provide extensive heating areas that are for the most part vertical surfaces; to achieve a design for the tubes that inherently creates efficient liquid circulation with special reference to widespread effective wiping action of the tube surfaces by the liquid to favor rapid heat transference; to provide heat exchange tubes of long life free from such items as internal transverse baffles that tend to deteriorate in service; to provide tubes inherently favoring rapid gas flow therethrough with a consequent low film coefficient; to provide tubes that inherently minimize stratification of the enclosed hot gas streams; to provide tubes operating with low draft losses; to provide tubes in which the maximum distance from any point in the enclosed gas stream to the nearest heat exchange surface is short; to provide tubes in which this distance in the hottest upper zones of the tubes is exceedingly short; to provide a tube configuration that minimizes turbulence and the formation of vortices in the liquid body immediately above the tube; to provide tubes that do not favor the trapping or accumulation of food particles thereon; to arrive at dimensional relationships in tubes effective for highly efficient heat transference, with special reference to the ratio between the width and depth of a tube and the ratio of the length to the cross-sectional area of a tube; and to provide a tube construction that may be fabricated inexpensively.

When the above objects are accomplished in the design of a receptacle and in the design of the tubes therein, any conventional type of burner may be adapted thereto and combined therewith to achieve efficiencies in performance heretofore unattained. The preferred practice of my invention, however, is characterized by the use of a special burner arrangement to achieve further efficiencies.

With reference to the new burner construction, my invention has the following objects: to provide a burner that achieves combustion within the confines of the tubes, thereby using the liquid body for heat insulation and avoiding the necessity of a separate troublesome firebox; to provide a burner that consumes gaseous fuel with satisfactory combustion characteristics including minimum production of carbon monoxide; to provide a burner that favors high velocity flow of hot gases along the inner surfaces of the associated tube; to provide a burner that supports combustion of large quantities of gas in the associated tube, an achievement that is difficult because the tube walls are in effect liquid-cooled; to achieve a burner that utilizes primary air at an exceptionally high rate to favor rapid and complete combustion in the associated tube; to achieve a high loading of the burner ports heretofore unattained in confined burners, thereby developing a high rate of heat generation in the limited combustion space available; to provide a burner construction especially suitable for supporting efficient combustion in a narrow tube; to provide for continuous fuel velocity throughout the burner system; to achieve a stabilized high-velocity flame with a high ratio of primary air without incurring high frequency flutter or whistling of the burner flame; and to arrive at a dimension, spacing and disposition of the burner ports to achieve the desired character of combustion.

The above and other objects will be apparent in my following detailed description of a preferred form of my invention, taken with the accompanying drawing.

In the drawing, which is to be considered as illustrative only:

Fig. 1 is a plan view of a deep fat fryer embodying the invention;

Fig. 2 is a side elevation of the device with various walls broken away to reveal the construction;

Fig. 3 is a transverse section taken as indicated by the line 3—3 of Fig. 2;

Fig. 4 is an enlarged fragmentary section of a burner head and the adjacent end of the corresponding tube;

Fig. 5 is a section taken as indicated by the line 5—5 of Fig. 4;

Fig. 6 is a transverse section of a tube employed in the preferred practice of my invention; and

Figs. 7 to 10 respectively are similar views showing other tube configurations that may be used.

The principal parts of the device shown in the drawing include a receptacle or cooker tank generally designated 20, an outer housing 21 providing a burner compartment 22, a series of heat exchange passage means 23, which may be loosely referred to as tubes, extending through the receptacle from the burner compartment to a stack 25, and, finally, a burner generally designated 26 positioned to direct combustion into the tubes. In the present construction the outer housing 21 serves as a box-like base for supporting the receptacle 20, the receptacle being unitary with the housing along its rim.

The receptacle 20 may be regarded as divided into various zones. The upper part of the receptacle forms an expansion zone or space 27 (Fig. 2) into which the cooking fluid may surge without overflow, the wall of the receptacle forming a drainage apron 28 in this zone. Below the expansion space 27 the receptacle 20 is restricted in width to space the side walls 30 of the receptacle from the corresponding side walls of the outer housing 21. Lying below the expansion space 27 and above the series of heat exchange tubes 23 is a cooking zone 31 in which the normal liquid level 32 may be approximately 2¾″ above the tubes. The vertical extent of the tubes 23 determines what may be termed a heat exchange zone 33 and below this zone is what may be termed a cold zone 35, the term, of course, being relative. In my preferred construction the bottom wall 36 of the receptacle is inclined laterally to one side as indicated in Fig. 3 and is longitudinally inclined to the middle as indicated in Fig. 2, thus leading to a suitable draw-off pipe 37 controlled by a suitable valve 38.

The heat exchange tubes 23 have various cross-sectional configurations in accord with the concepts underlying the above-mentioned objects of my invention. Generally speaking, the tubes should be relatively narrow and relatively deep in cross section, thus providing relatively extensive vertical surfaces. In the present arrangement suitable for a fryer 7″ x 14″ I employ four tubes 23 of the cross-sectional configuration shown in Fig. 6, each tube having a convex upper wall 40, flat side walls 41, and a V-shaped bottom 42. Such a tube may be formed by suitably bending a single metal sheet. Other cross-sectional configurations for the tubes 23 that may be suggested are shown in Figs. 7, 8, 9, and 10. In all these tubes the cross-sectional axes are unequal.

In my preferred construction the heat exchange tubes 23 are something less than 3½″ in vertical dimension, for example, approximately 2½″ inside diameter. I have found it to be advantageous to make the tubes of tapering configuration to compensate for contraction by cooling of the combustion gases, the tapering serving to minimize the film coefficient. Tapering the width of each tube from approximately $\frac{11}{16}$″ inside width at the burner end to approximately $\frac{7}{16}$″ inside width at the exhaust end is suggested. One feature of employing such tapered tubes is that the tubes may be uniformly spaced and yet lie in converging disposition to provide a relatively wide clearance space 45 (Fig. 1) on the deeper side of the receptacle 20, such a space being desirable both for convenience in periodically cleaning the receptacle and for properly locating a thermostat element.

Fuel gas for the burner passes from a horizontal pipe 46 upward through a cut-off valve 47 and through a vertical pipe 48 to a thermostat-controlled valve 50 and is then delivered by a pipe 51 to the intake of a burner manifold 52. The burner manifold forms a gooseneck 53 and may branch to form two burner heads 55, which burner heads may be spaced approximately ¾″ from the intake ends of the heat exchange tubes 23. The two burner heads 55 provide four burner faces 56 (Figs. 4 and 5), there being one burner face opposite each heat exchange tube 23. To provide a pilot flame for the burner the pipe 48 may be provided with a small branch 57 having a pilot light valve 58. For automatic regulation a small tube 60 is shown extending from the thermostat-controlled valve 50 to a thermostat element 61 inside the receptacle 20.

As best shown in Fig. 2, the manifold 52 flares in configuration for a certain distance from the intake end to provide a suitable space for inspiration and initial intermixture of primary air with the gaseous fuel. Beginning at the gooseneck 53 the manifold is substantially constant in cross-sectional area to maintain the velocity of the gaseous stream until the stream reaches the burner heads 55. Each of the burner faces 56 is somewhat less in area than the intake end of the corresponding tube.

An important feature of my burner is the manner in which each burner face 56 is apertured to provide burner ports. It has been found that the necessity for a high rate of heat generation within the extremely limited space available may be met only by circumscribed conditions. Among other factors, the spacing and dimensioning of the burner ports are critical.

The fuel used in the course of developing the present embodiment of the invention is 1100–1120 B. t. u., .62–.65 specific gravity, natural gas composed chiefly of methane and ethane, the gas being supplied at 7″ of water pressure at the intake orifice of the manifold, the intake orifice being drilled with a No. 47 standard twist drill. Under such conditions of fuel supply I provide twenty-two spaced ports 62 in each burner face 56, the ports being arranged in eleven rows of two each and being bored by a No. 40 standard twist drill. As best shown in Fig. 4, primary hydroxylation cones 63 form at the ports 62 and, of course, the flame mantle (not shown) extends into the heat exchange tubes 23 and may under certain conditions even reach the stack 25.

Twelve rows of the ports 62 instead of eleven rows may be provided but when an attempt is made to employ thirteen rows it is found that the holes must be placed too close together for efficient operation, the close spacing tending to cause the primary cones to merge and thereby interfere with the penetration of secondary air. The use of smaller holes in larger number to provide the same total of port area is likewise impractical because the holes must be placed too close together. If an attempt is made to use ports of larger diameter, for example, ports drilled by a No. 38 standard twist drill, the burner flame at time of extinction flashes back into the burner head. It will require merely the skill expected in this art to vary the dimensions and spacing of the ports 62 for optimum combustion with gas of a different character or supplied at different pressure.

A burner constructed in the manner described has a persistent tendency to whistle. I have found that the high pitch noise is generated by a high frequency flutter of the flame, and I have further found that the flutter is caused by secondary air being swept rapidly into the base of the flame and interfering with the flame to such an extent as to make the cones 63 unstable. The whistling seems to be a function of the thickness of the aggregate flames from a burner face, being especially persistent in the thin flames required here, and the whistling is found to occur more readily when a burner face is placed relatively close to the intake end of a tube as required here. One feature of my invention is the discovery that the whistling may be entirely eliminated by placing a suitable wall or baffle around the burner face to change the direction of approach of the streams of secondary air. Figs. 4 and 5, for example, show such a wall 65 encompassing a burner face 56, the wall deflecting the secondary air outward away from the bases of the primary cones 63.

In designing burners of the general character with which we are concerned here, it is customary to provide sufficient port area relative to the B. t. u. combustion to burn 10,000 to 15,000 B. t. u./sq. in. total port area. Any substantially higher port loading has been widely regarded as not feasible in any burner employed in a restricted space. In the present arrangement the twenty-two burner ports 62 burn 6000 B. t. u., the result being a port loading of slightly over 36,000 B. t. u./sq. in., a loading heretofore unattained in such burners.

The deep fat fryer shown in the drawing is of relatively small size, being 7″ x 14″ tank dimensions. Larger sizes are also supplied, one being 14″ x 14″ and differing from the smaller size in having twice as many heat exchange tubes and burner faces. The outstanding performance of my invention may be appreciated by comparison with a typical 14″ x 14″ deep fat fryer now in use. The typical fryer under consideration, which has been given the highest rating in standard tests, employs three cylindrical heat exchange tubes 2½″ in diameter instead of eight tubes of the configuration described above. The recovery speed of a fryer is, in general, proportional to its ability to raise a normal frying depth of grease from room temperature to 390° F. and this test is used by most laboratories. The prior art fryer with the three cylindrical heat exchange tubes raised its cooking liquid from room temperature to 390° in 17 minutes with a burner input of 37,500 B. t. u./hour. The present 14″ x 14″ fryer raises its cooking liquid of the same cooking depth to 390° in 11.0 minutes with an input of 48,000 B. t. u./hour. It is apparent that the shortened time period is not attributable solely to the higher B. t. u. input, since the higher input alone would reduce the 17 minutes to 13.3 minutes, not 11 minutes. The efficiency of the new fryer relative to the prior art fryer equals

$$\frac{17\times 37{,}500}{11\times 48{,}000}=1.20+$$

or a 20% gain in efficiency. The speed of temperature increase achieved in my fryer resides in part in the shape and dimension of the heat exchange tubes and in part in the character and loading of the burner.

In comparing my eight tubes with the three 2½″ cylindrical tubes, it is found that the total displacement of the eight tubes is 192 cu. in. as against 206 cu. in. and the total heating surface is 714 sq. in. as against 330 sq. in. Because of the increased heating area, the 48,000 B. t. u. input of the eight tubes imposes load on the heating surface of only 67 B. t. u./sq. in., whereas the 37,500 B. t. u. input on the three cylindrical tubes results in the relatively high load of 114 B. t. u./sq. in. This comparison emphasizes the gain in total area for heat exchange achieved by using relatively narrow tubes with extensive vertical areas. The relative cross-sectional areas of the tubes are also important for comparison. The ratio of length of tube to cross-sectional area for a cylindrical tube 2½″ in diameter and 14″ long is 2.9, and no prior art tubes within my knowledge have had a ratio as high as 5.5. The corresponding ratio for each of the tubes described herein is 6.9 at the firing end of the tube and 10.0 at the exhaust end.

The disclosure herein in specific detail of a preferred embodiment of my invention will suggest to those skilled in the art various substitutions and modifications under my basic concept, and I reserve the right to all such departures from my description that properly come within the scope of my appended claims.

I claim as my invention:

1. A frying apparatus having in combination: a receptacle for cooking liquid; a plurality of heat exchange passage means in said receptacle; gas combustion means including a burner face opposite from and spaced from each of said passage means, said burner face having a plurality of small burner ports spaced apart to form substantially separate primary hydroxylation cones; and means outward from the plane of each of said burner faces to deflect laterally incoming secondary air away from the bases of said primary cones to prevent soniferous fluctuation of the gas streams in the regions of said cones.

2. A frying apparatus having in combination: a receptacle for cooking liquid; a plurality of heat exchange passage means in said receptacle, each of said passage means being relatively narrow in horizontal width to provide predominantly upright heat exchange surfaces; gas combustion means including a burner face opposite from and spaced from each of said passage means, said burner face having a plurality of small burner ports spaced apart to form substantially separate primary hydroxylation cones; and means outward from the plane of each of said burner faces to deflect laterally incoming secondary air away from the bases of said primary cones to prevent soniferous fluctuation of the gas streams in the regions of said cones.

3. A frying apparatus having in combination: a receptacle for cooking fluid; and a plurality of elongated substantially horizontal heat exchange passage means in said receptacle, the longitudinal axes of said passage means converging toward the exhaust ends of the plurality of pas-

sage means, each passage means being relatively narrow and flat and disposed to provide predominantly vertical heat exchange faces, each passage means tapering to diminish in cross sectional area from its inlet end to its exhaust end, the convergence of said axes compensating for the taper of said passage means whereby to provide uniform width of spaces between said passage means.

4. A frying apparatus having in combination: a receptacle for cooking liquid; and a plurality of substantially horizontal heat exchange passage means in said receptacle, the longitudinal axes of said passage means converging toward the exhaust ends of the plurality of passage means, each of said passage means being relatively narrow in horizontal width to provide predominantly upright heat exchange surfaces and to provide a ratio of length in inches to average cross-sectional area in square inches greater than 5.5 based on a length in the order of 14 inches.

5. A frying apparatus having in combination: a receptacle for cooking liquid; and a plurality of spaced heat exchange means forming single, unobstructed open ended combustion passages spaced from each other in said receptacle, said passages being of diminishing cross-sectional areas from their inlet ends to their exhaust ends, said passages being relatively narrow in one dimension to provide predominantly vertical heat exchange surfaces and a ratio of length in inches to average cross-sectional area in square inches greater than 5.5 based on a length approximating fourteen inches.

6. In a frying apparatus of the character described providing a receptacle for cooking liquid, the combination of: a heat exchange passage across said receptacle positioned for submersion in said liquid; gas combustion means including a burner face at the inlet end of said passage, said burner face having a plurality of small burner ports spaced apart to form substantially separate primary hydroxylation cones, said burner face being spaced from the inlet end of said passage to permit secondary air to be drawn laterally into the passage end; and means extending outward from the plane of said burner face to deflect the laterally incoming secondary air away from the bases of said primary cones to prevent soniferous fluctuation of the gas streams in the regions of said cones.

7. A frying apparatus having in combination: a receptacle for cooking liquid; a plurality of heat exchange means forming unobstructed open ended combustion passages in said receptacle positioned for submersion in said liquid, said passages being relatively narrow to provide a ratio of length in inches to cross-sectional area in square inches greater than 5.5 based on a length approximating fourteen inches; gas combustion means providing a burner face at the inlet end of each of said passages, each of said burner faces having a plurality of small burner ports spaced apart to form substantially separate primary hydroxylation cones, said ports of each face being arranged in a pattern of relatively narrow width conforming substantially to the cross-sectional area of the corresponding passage, each of said burner faces being spaced from the inlet end of the corresponding passage to permit lateral intake of secondary air; and means extending from each of said burner faces toward the corresponding passage to deflect laterally incoming secondary air away from the bases of said primary cones to prevent soniferous fluctuation of the gas streams in the regions of said cones.

8. A combination as set forth in claim 7 in which said passages progressively diminish from their inlet ends to their outlet ends.

9. A combination as set forth in claim 7 in which said passages progressively diminish in cross section from their inlet ends to their outlet ends and in which the longitudinal axes of the passages converge toward their outlet ends to maintain between said passage means liquid spaces of substantially uniform width.

10. A frying apparatus having in combination: a receptacle for cooking liquid; and a plurality of spaced heat exchange means forming single, unobstructed open ended combustion passages in said receptacle, said passages being of progressively diminishing sectional areas from their inlet ends to their exhaust ends, said passages having a ratio between maximum and minimum cross-sectional dimensions of at least 2 and providing predominantly vertical heat exchange walls, said passages having a ratio of length in inches to average cross-sectional areas in square inches greater than 5.5 based on a length approximating fourteen inches, the longitudinal axes of said passages converging toward the exhaust ends of the passages.

11. A frying apparatus having in combination: a receptacle for cooking liquid; and horizontal heat exchange means having a width not substantially greater than half its vertical dimension and providing predominately vertical heat exchange surfaces, said passage having a single traverse across said receptacle and having a ratio of length in inches to average cross-sectional area in square inches of at least about 6.9, the length of the passage being in the order of 14 inches.

12. A frying apparatus having in combination: a receptacle for cooking liquid; substantially horizontal heat exchange means providing a substantially horizontal open-ended combustion passage therethrough, said passage having an effective horizontal cross-sectional dimension not substantially greater than half its vertical dimension, and said passage having a ratio of length in inches to average cross sectional area in square inches greater than 5.5 based on a length approximating fourteen inches.

13. A frying apparatus having in combination: a receptacle for cooking liquid; a substantially horizontally disposed elongated heat exchange means having a substantially horizontal combustion passage therethrough; burner means disposed at one end of said passage and being arranged to project a flame directly into said passage, said burner means having a plurality of ports arranged to form a flame of substantially the same configuration as said passage and of cross-sectional area not exceeding the cross-sectional area of said passage, said ports being spaced from one another and adapted to form separate primary hydroxylation cones; and means on said burner means and extending outwardly from the sides of said ports to deflect incoming secondary air away from said primary hydroxylation cones.

14. A frying apparatus having in combination: a receptacle for cooking fluid; a plurality of substantially horizontal heat exchange passage means in said receptacle, each of said passage means being of diminishing cross-sectional area from the inlet end to the exhaust end of the passage means, said passage means being relatively

narrow in horizontal width to provide predominantly upright heat exchange surfaces; gas combustion means providing a burner face spaced from and directed toward each of said passage means, said burner face having a plurality of small ports spaced apart to form individually separate primary hydroxylation cones; and means on said burner faces and extending outward from the plane of each of said burner faces to deflect laterally incoming secondary air away from the bases of said primary cones to prevent soniferous fluctuation of the gas stream in the regions of said cones.

15. A frying apparatus comprising in combination: a receptacle for cooking liquid; and an elongated substantially horizontal single pass heat exchange means extending through said receptacle for heating cooking liquid, said means providing a substantially horizontal combustion passage diminishing in cross-sectional area from its inlet end to its exhaust end, said passage being narrow in width to provide predominantly upright heat exchange surfaces, the passage having unobstructed open ends to provide free gas flow, and the ratio of the length in inches of said heat exchange means to its cross-sectional area in square inches being greater than 5.5, said length being in the order of fourteen inches.

16. A frying apparatus having in combination: a receptacle for cooking liquid; and a plurality of spaced heat exchange means forming separate, unobstructed open ended combustion passages spaced from each other in said receptacle, each of said passages having a ratio of length in inches to cross-sectional area in square inches greater than 5.5 based on a length approximating fourteen inches, the ratio between vertical and horizontal cross dimensions of the passages being at least 2, each of said passages making a single traverse across said receptacle.

17. A frying apparatus having in combination: a receptacle for cooking liquid; and a plurality of spaced horizontal heat exchange means forming spaced unobstructed open ended combustion passages separated from each other in said receptacle, each of said passages being not more than half as wide horizontally as vertically to provide predominantly upright heat exchange surfaces, each of said passages having a ratio of length in inches to average cross-sectional area in square inches greater than 5.5 based on a length in the order of fourteen inches.

18. A frying apparatus having in combination: a receptacle for cooking liquid; a plurality of spaced heat exchange means forming passages in said receptacle positioned for submersion in said cooking liquid, each of said passages being of progressively diminishing cross-sectional area from its inlet end to its exhaust end, each of said passages being relatively narrow to provide a ratio of length in inches to average cross-sectional area in square inches of at least 5.5 based on a length in the order of fourteen inches; gas combustion means providing a burner face at the inlet end of each of said passages, each of said burner faces having a plurality of small ports spaced apart to form individually separate primary hydroxylation cones, said burner faces being spaced from the corresponding passage ends to permit secondary air to be drawn laterally into the passage ends; and means positioned outwardly from the plane of each of said burner faces to deflect the laterally incoming secondary air away from the bases of said primary cones to prevent soniferous fluctuation of the gas streams in the regions of said cones.

EDWARD L. KELLS.

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(No Model.) 2 Sheets—Sheet 1.

W. SWINDELL.

GAS STOVE.

No. 366,701. Patented July 19, 1887.

Fig. 1.

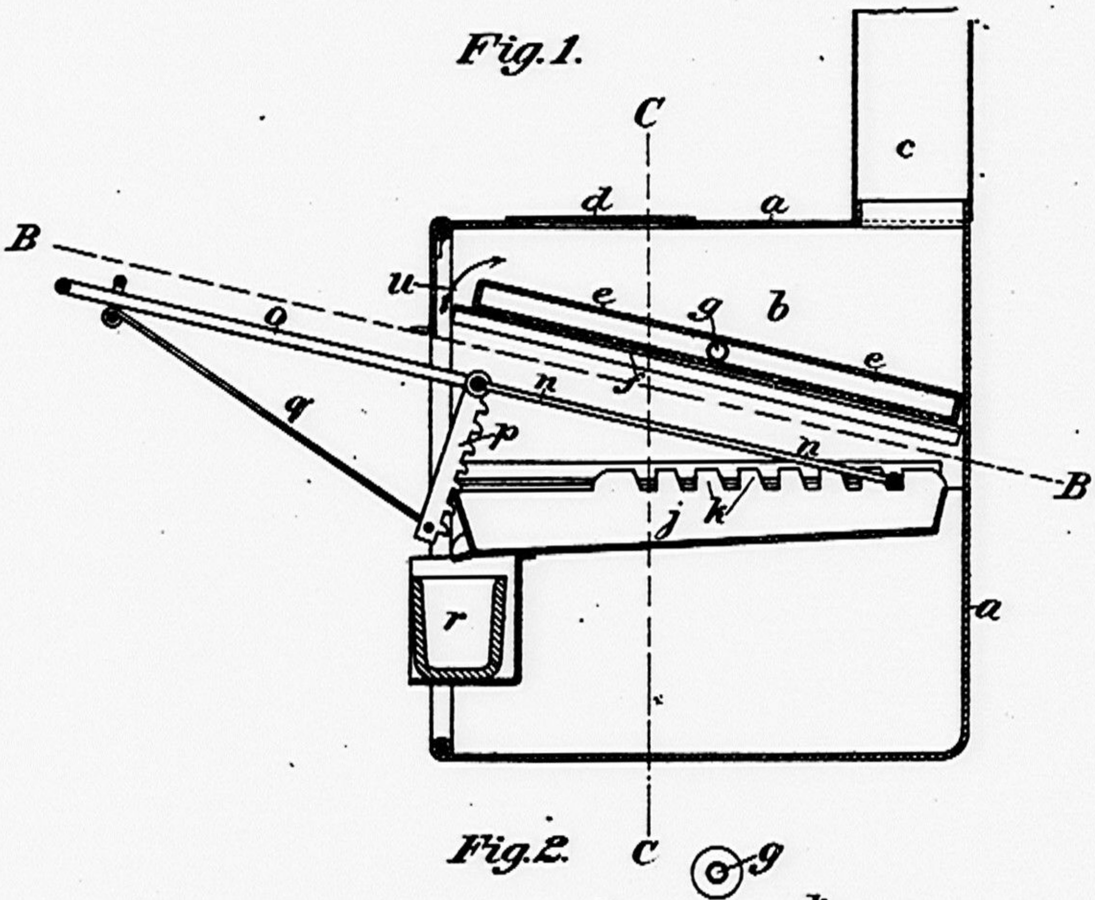
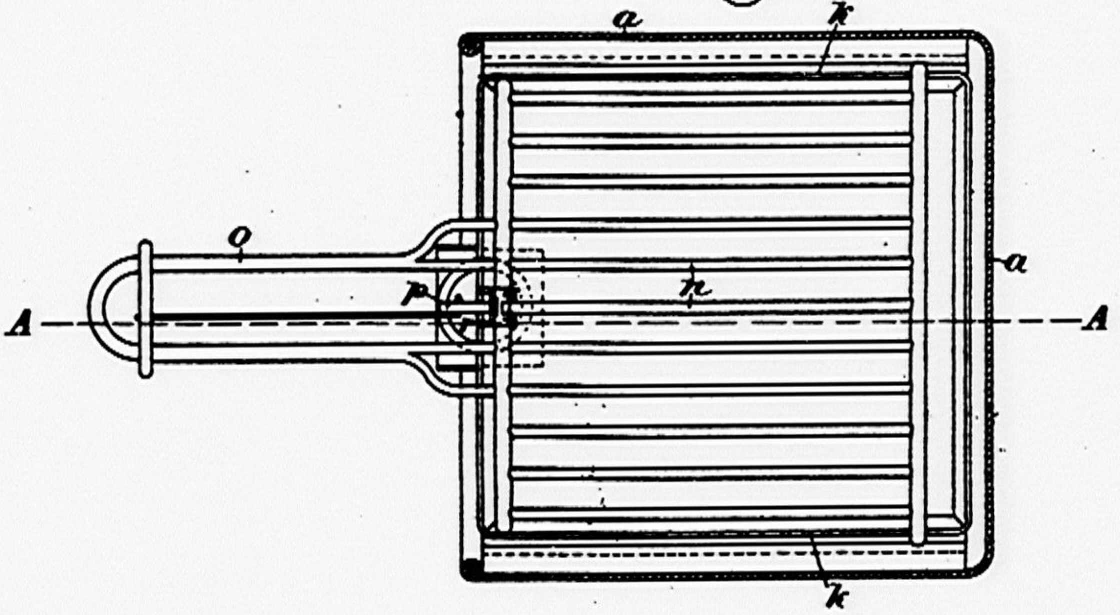


Fig. 2.



Witnesses.

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(No Model.)

2 Sheets—Sheet 2.

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GAS STOVE.

No. 366,701. Patented July 19, 1887.

Fig. 3.

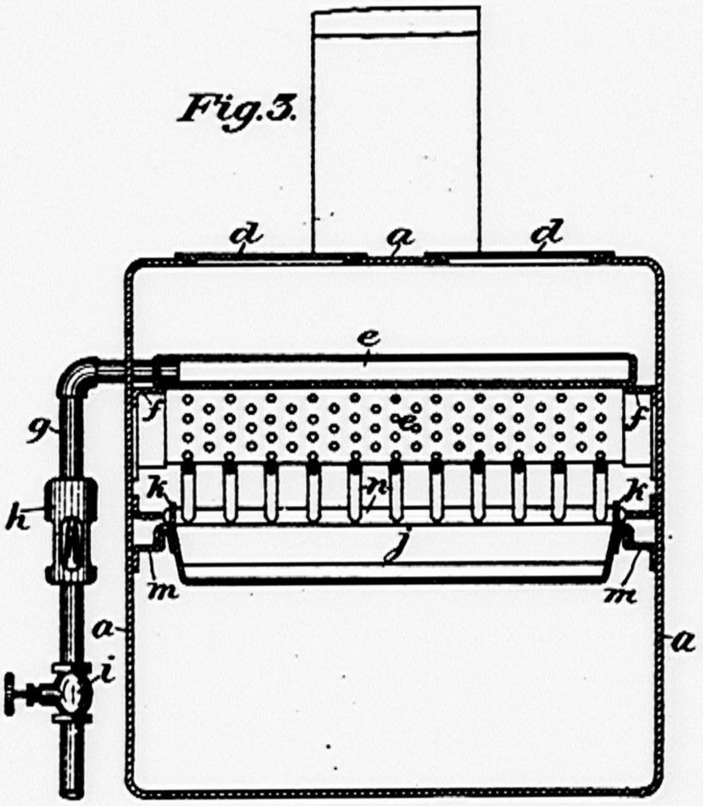


Fig. 4.

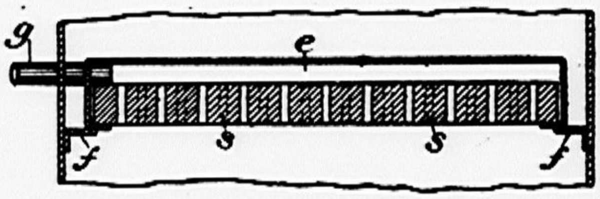


Fig. 5.

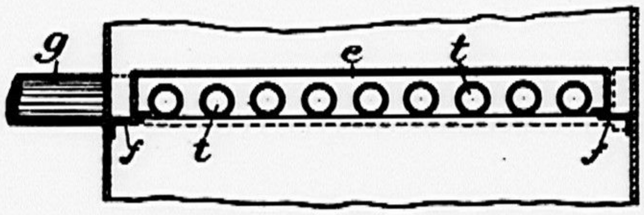
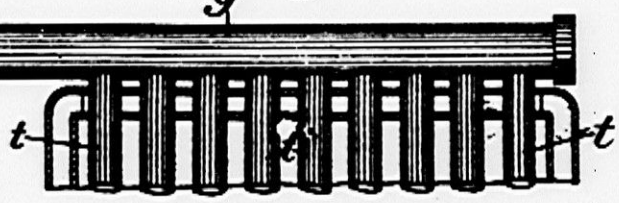


Fig. 6.



Witnesses.

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WILLIAM SWINDELL, OF ALLEGHENY CITY, PENNSYLVANIA.

GAS-STOVE.

SPECIFICATION forming part of Letters Patent No. 366,701, dated July 19, 1887.

Application filed June 19, 1886. Serial No. 205,596. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SWINDELL, of Allegheny City, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Gas-Stoves; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention is particularly designed for use with natural gas, but is also useful with other forms of gaseous fuel.

To enable others skilled in the art to make and use my invention, I will now describe it by reference to the accompanying two sheets of drawings, in which—

Figure 1 is a vertical section of a cook stove provided with a broiler attachment, taken on the line A A of Fig. 2. Fig. 2 is a plan section taken on the line B B of Fig. 1. Fig. 3 is a vertical cross section on the line C C of Fig. 1. Figs. 4, 5, and 6 are views of modified details.

Like letters of reference indicate like parts in each.

The stove *a* is of any suitable form, having a combustion-chamber, *b*, a flue or chimney, *c*, and cooking-holes, closed by lids *d*, on the top. Supported in the chamber *b*, preferably in an inclined position upon flanges *f*, secured to the sides of the stove, is a hollow plate, box, or casing, *e*, having its under side perforated, as plainly shown in the drawings, and connected with this plate is a gas-pipe, *g*, which extends through the side of the stove, as shown in Fig. 3. This gas-pipe is provided with an ordinary mixer, *h*, or other device for supplying air to support combustion, and a cock, *i*, for controlling the admission of the gas. The plate *e* is shorter than the depth of the stove *a*, so that the products of the combustion which takes place under the plate can escape either around the front edge of the plate, as at *u*, Fig. 1, or at a similar opening at the back of the same. These products then pass out of the chimney *c*. Supported on flanges *m*, below the flanges *f*, is a drip-pan, *j*, having notched or serrated edges *k*, the purpose of which is to receive the inner bar or edge of the gridiron *n*. This gridiron is removable, being inserted through the front opening or door of the stove when needed for use. It has a handle, *o*, and a rack, *p*, connected to its front bar, which is held in place by a brace, *q*, extending from the end of the handle. This rack *p* is to afford means for supporting the gridiron in an inclined position by hooking one of its teeth over the edge of the drip pan *j*. The position of the gridiron *n* with relation to the adjacent surface of the plate *e* can be varied, as will be evident, by placing it in different notches of the edges *k* of the pan *j*, and supporting its front edge correspondingly by the rack *p*. The bottom of the drip pan *j* is suitably inclined, and empties by a spout into a receptacle, *r*, for receiving the drippings from the cooking article.

By this construction it is apparent that the broiler *n* can be used in such a manner as to perfectly utilize the heat from the gas-flames without having its contents exposed to contact with the gas or the products of the combustion thereof, so that its flavor will not be affected in any way thereby. The inclined position of the plate *e* causes it to act as a reflector of heat into the room, while the combustion of the gas on the under side of the plate prevents its direct escape into the chimney-flue, and so increases the chances of its more perfect mixture with the air, and consequently more complete combustion, while at the same time the flame and products of combustion pass upward to the flue, the distance between them and the gridiron being regulated at will.

The construction shown, whereby the heat and products of combustion pass around the front end of the plate *e*, causes the same to be brought directly under the cooking-holes *d*, and constitutes a very perfect application of the heat at that point where it is needed for general cooking purposes. This construction can be applied to cooking-stoves and ranges of all ordinary descriptions, in many of which the flue *c* would be arranged beyond the bake-ovens and water-reservoir attachments, as will be understood, so that the heat may be applied thereto on its passage from the combustion-chamber *b* to the flue *c*. These things constitute no part of my invention, and do not require to be illustrated or further explained.

I do not limit myself to any particular means for supplying the gas to the plate *e*, nor to any particular construction of the air-mixer *h*, as any suitable device for supplying air for combustion may be adopted.

In Fig. 4 I show a modification in the construction of the plate *e*, which consists in having its perforated under side formed of a refractory tile or tiles, *s*; and in Fig. 5 I show the plate *e* open on its under side and provided with a series of perforated pipes, *t*, the perforations being made direct and inclined so as to spread the flame-jets on all sides. In this instance the supply-pipe *g* would run across the ends of the pipes *t*, the latter being connected thereto, as shown in Fig. 6.

The operation of my improvement is obvious. The gas passing from the pipe *g* into the plate *e* spreads out therein and escapes through the perforations on the under side, becoming ignited as soon as it escapes, and burns with short jets or flames over the whole under surface of the plate *e*. The heat from this combustion is radiated down upon the broiler *n*, and then passes, together with the products of combustion, around the front edge of the plate into the upper part of the combustion-chamber under the lids *d*, and passes thence to the escape-flue *c*.

I do not limit myself to any particular construction of the plate *e*, except that it should extend across or nearly across the combustion-chamber *b* in an inclined position, as shown in the drawings, and discharge the gas therein from the under side, so that the combustion takes place below the plate.

The burner-plate *e* is removable, it being only necessary to detach the pipe *g* therefrom as it rests loosely on the flanges *f*. The flanges *f* are preferred as a supporting device, because they cut off the passage at the sides of the burner-plate *e*, and thus render it unnecessary to fit the burner-plate *e* closely to the stove. As far as the supporting feature is concerned, lugs or other suitable supporting devices would do, and they are mentioned as the equivalents of the flanges *f*. The drip-pan *j* is also removable. It may be supported in any suitable way.

I am aware that a hollow burner-plate having perforations on its under side is not new in gas stoves, and I do not desire to claim the same, broadly.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a gas-stove, a hollow burner-plate inclined upward from the back of the stove toward the front thereof and provided with perforations on its under side, and a flue situate between the burner-plate and the front of the stove, forming communication between the two portions of the stove above and below the burner-plate, so as to permit of the upward passage of the products of combustion toward the front of the stove to radiate the heat forward and downward, substantially as and for the purposes specified.

2. In a gas-stove, a hollow burner-plate, *e*, inclined upward from the back of the stove toward the front thereof and provided with perforations on its under side, in combination with a broiler, *n*, situate below the plate and pivoted at its rear end, and a rack for adjustably supporting the forward end of the broiler, so as to regulate the distance between it and the burner-plate, substantially as and for the purposes specified.

3. In a gas stove, the combination of the broiler *n*, rack *p*, and drip-pan *j*, having serrated edges, substantially as and for the purposes described.

4. In a gas-stove, a hollow burner-plate formed of tubes placed close together, inclined upward from the back to the front of the stove and provided with perforations on their under side, in combination with a broiler, *n*, pivoted at its rear end below the burner-plate, and a rack for adjustably supporting the forward end of the broiler so as to regulate the distance between it and the burner-plate, substantially as and for the purposes specified.

5. The combination of a drip-pan supported in a stove having notched edges, with a gridiron supported upon the drip-pan, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 5th day of June, A. D. 1886.

WILLIAM SWINDELL.

Witnesses:
W. B. CORWIN,
JNO. K. SMITH.

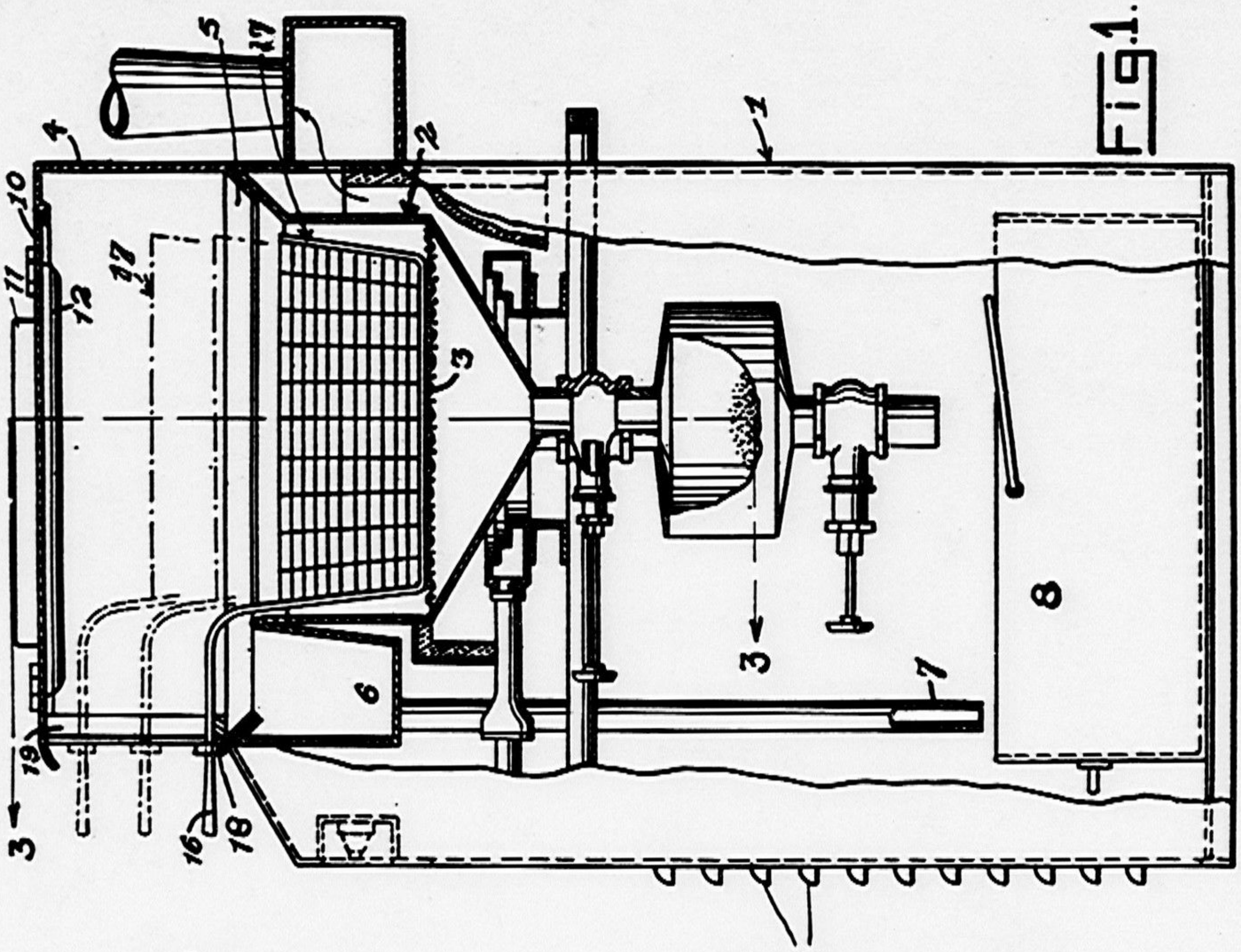
183

Nov. 7, 1950 P. M. PAPPAS **2,528,776**

DEEP FAT FRYING APPARATUS

Filed Jan. 13, 1947 2 Sheets-Sheet 1

Fig. 1.



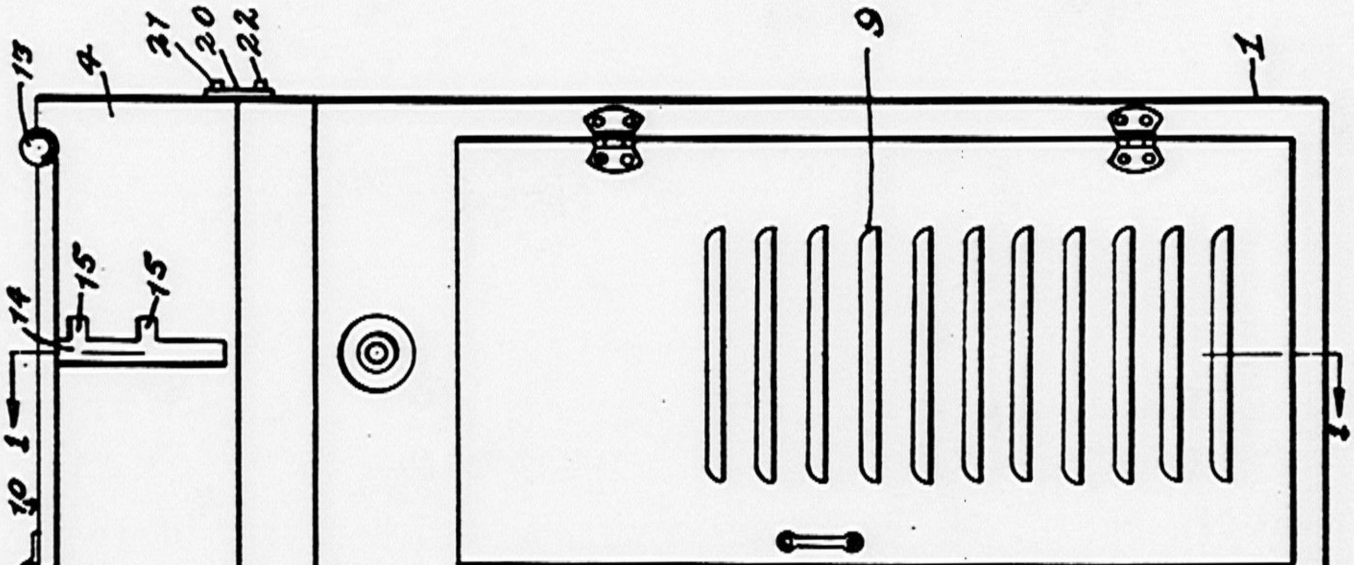


Fig. 2.

INVENTOR,
Phillip M. Pappas.
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Nov. 7, 1950 P. M. PAPPAS 2,528,776

DEEP FAT FRYING APPARATUS

Filed Jan. 13, 1947 2 Sheets-Sheet 2

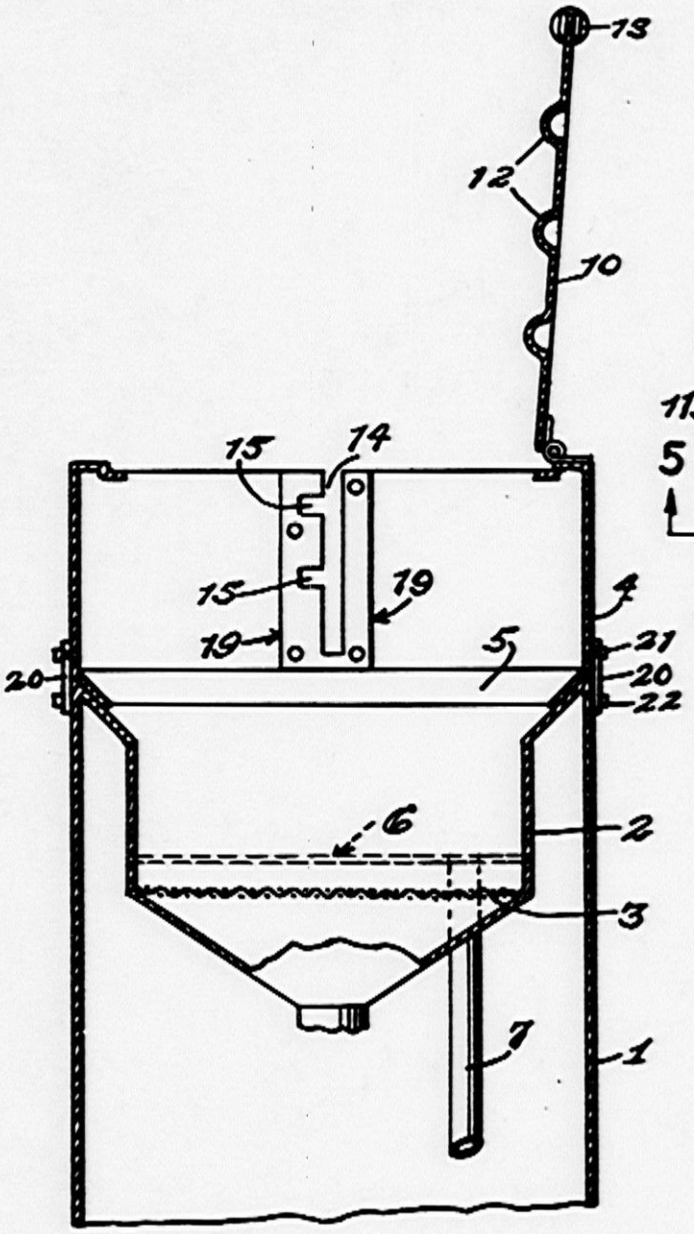

Fig. 3.

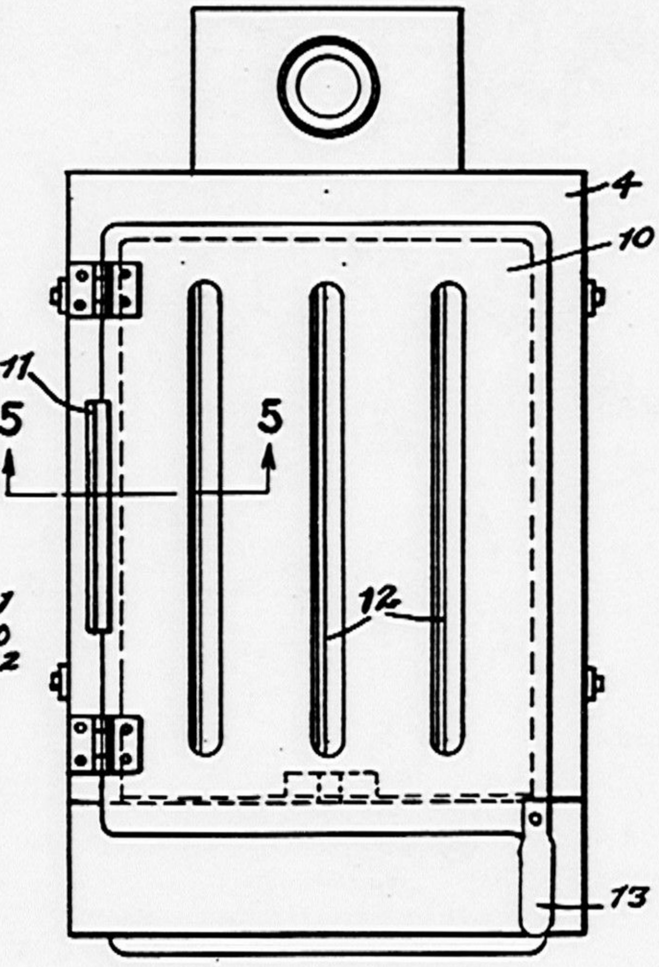

Fig. 4.

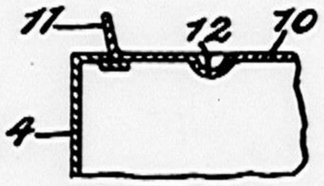

Fig. 5.

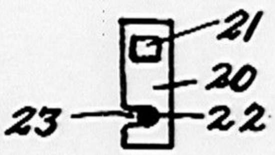

Fig. 6.

INVENTOR,
Philip M. Pappas,
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Patented Nov. 7, 1950 **2,528,776**

UNITED STATES PATENT OFFICE

2,528,776

DEEP FAT FRYING APPARATUS

Phillip M. Pappas, Houston, Tex.

Application January 13, 1947, Serial No. 721,747

1 Claim. (Cl. 99—411)

This invention relates to a deep fat frying apparatus.

An object of this invention is to prevent loss of grease caused by splatter, as well as vapor coming off the hot fat.

Another object of this invention is to lessen fire hazard and permit a cleaner and more sanitary appearance to the deep fat frying operation in commercial eating establishments.

It is to be understood that in deep fat frying there is a considerable amount of grease lost by splatter when cold foods are deposited in the hot frying fat. The fat will often splatter several feet when cold foods are placed therein. This results in loss of fat, fire hazard, and a deposit of undesirable film of fat on surrounding equipment, hoods, ducts, air filters, etc. In addition to the loss through splatter, there is a certain amount of fat lost in the vapors or smoke coming off the fat, which vapors condense and become deposited on the hood above the equipment, or in the air filter placed on the duct leading from the hood.

There is also present in the deep fat frying operation the danger loss in resultant mess caused by fat foaming or boiling up over the sides of the frying container. This can be observed when raw French cut potatoes are placed in the hot frying fat; the fat will boil up considerably with a result that it will sometimes overflow the fryer and run down the sides of the cabinet.

Therefore, still another object of this invention is to prevent the loss of fat by splatter, as well as that carried off by the vapors and the smoke of the fat, which is accomplished by a novel and efficient hood that fits over the top of the frying container in such a manner that it can be easily detached and cleaned. This hood is provided with a hinged cover or lid so that the chef may easily open or close same for putting in and taking out the baskets containing food, and may conveniently observe the food cooking.

This invention relates to certain valuable improvements over the disclosure in my prior United States Patent No. 2,338,964, issued January 11, 1944, upon a frying apparatus.

With the foregoing and other objects in view, my invention comprises certain novel constructions, combinations, and arrangements of parts as will be hereinafter fully described, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

In the drawings:

Figure 1 is a vertical sectional view of an apparatus constructed in accordance with the present invention, taken on line 1—1, Fig. 2, and looking in the direction of the arrows, while

Figure 2 is a view in front elevation.

Figure 3 is a fragmentary sectional view taken partly on line 3—3, Figure 1, and looking in the direction of the arrows.

Figure 4 is a top plan view.

Figure 5 is a sectional view taken on line 5—5, Fig. 4, and looking in the direction of the arrows.

Figure 6 is a view in elevation of one of the four slip-type metal straps.

Referring to the drawings in which the preferred embodiment of my invention is illustrated, 1 designates the cabinet in which is the frying container 2 having screen 3.

A cover or hood 4 is on the upper end of the cabinet 1, this hood 4 being provided with an inwardly extending flange 5; said flange 5 fits snugly upon the upper end of the frying container 2 as clearly shown in Figure 1. An overflow well 6 is formed in the cabinet and extends across the entire front of the frying container 2. The top of the overflow well 6 is below the top of frying container 2 whereby any fat or grease boiling over the upper part of the frying container will flow into the overflow well 6 before running over the top edge of the frying container 2. A condenser pipe 7 is in communication at its upper end with the overflow well 6, and its lower end empties into the drain pan 8. Air passing in through the louvers 9 will chill or cool condenser pipe 7 sufficiently to congeal the fat or grease as is best when passing into the drain pan 8.

The hood 4 is provided on its top with a hinged cover or lid 10, which lid is provided with an elongated flange 11 that acts as a stop in preventing the raised lid (Fig. 3) from swinging too far open. The hinged lid 10 is also provided with elongated rounded depressions 12. A suitable handle 13 (Fig. 4) is on one end of the lid 10 for enabling the operator to easily manipulate the lid.

On the front of the hood 4 is a vertical opening 14 that has preferably two horizontal slots 15. When the handle 16 of the basket 17 is at the bottom of the vertical opening 14, the basket will be as shown in Figure 1, resting upon the screen 3. When desired, the operator can lift on the handle 16 placing it in the lower slot 15, or in the upper slot 15 as desired, which adjusted positions are shown in dotted lines, Fig. 1. The handle 16 is provided with a fixed flange 18 against the face of the hood 4. This flange 18 serves to position or center the basket 17 with respect to the frying container 2. The hood 4 is thickened at the portion in which the vertical opening 14 is formed as shown at 19 (Fig. 1). Therefore, the slots 15 and vertical opening 14, together with the flange 18, are in the nature of a stabilizing device, for holding the basket 17 in a horizontal position when raised within the hood, as shown by dotted lines in Figure 1. It will also be apparent that upon raising the hinged lid 10 and lifting upward on the handle 16, the basket 17 may be entirely removed from the cabinet and hood as the operator desires.

To lock the hood on the cabinet 1 against accidental displacement there is provided preferably flat metal straps 20, each strap 20 being rotatably secured, at 21, to the hood 4 while pin 22 is on the side of the cabinet 1, which pin 22 enters slot 23, whereupon the hood is temporarily locked upon the cabinet 1, against accidental displacement.

It is further to be understood that when the basket is in a raised position, as indicated by the dotted lines in Figure 1, said basket is in a draining position after the food is cooked. Deep frying is done when the basket handle is in the lowest position with the basket 17 resting on screen 3.

The easily removable hood 4 is designed in a manner so that the grease droplets will be returned to the frying container; further, the hood is easily removable without the use of any tools, so that it can be taken off and cleaned easily. The hood 4 is provided at the front with an adjustable basket handle support 14, 15, so that the food being fried may be lifted out of the fat and remain in a draining position without opening the cover of the hood 4. This is also important as it permits the operator to keep the food in the basket 17 warm until it is served.

Also, the middle position of the front basket rest permits surface frying, whereas, the lower position of the basket rest permits deep frying. It is therefore quite evident that the basket handle support incorporated into the front portion of the hood is a very important part of this invention.

In order to condense the vapors in the cooking operation, the condenser pipe 7 is provided which also serves to return the overflow from the foaming grease to the drip pan.

The elongated rounded depressions 12 serve to allow the splattered fat to accumulate sufficiently that it will drop back into the frying container 2.

For further information about the general features of this frying apparatus, reference may be had to my aforesaid United States Patent No. 2,338,964.

While I have described the preferred embodiment of my invention and illustrated the same in the accompanying drawings, certain minor changes or alterations may appear to one skilled in the art to which this invention relates during the extensive manufacture of the same, and I, therefore, reserve the right to make such alterations or changes as shall fairly fall within the scope of the appended claim.

What I claim is:

In an apparatus of the class described, the combination with a cabinet, of a hood fitted on said cabinet, said hood provided with a reinforced portion on its front, said reinforced portion provided with a vertical opening opened at its top, said hood provided with a horizontal slot near the middle of said opening and with a horizontal slot near the top of said opening, said slots opening at their outer ends upon said vertical opening, a movable lid on said hood and normally closing the upper end of said vertical opening, a basket in said cabinet, said basket provided with a handle extending through said vertical opening, said handle being adapted to rest in said horizontal slots, said handle provided outside of said hood with a fixed flange, said flange normally bearing against the outer face of said hood, and said fixed flange when engaging the outer face of said hood contiguous to either one of said horizontal slots adapted to hold the basket in a steady horizontal position within the hood, substantially as shown and described.

PHILLIP M. PAPPAS.

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PLAINTIFF-APPELLANT'S BRIEF.

IN THE

United States Court of Appeals for the District of Columbia

Nos. 13612 - 13613

RICHARD T. KEATING,
Appellant,
vs.
ROBERT C. WATSON, Commissioner of Patents,
Appellee.

Appeal from a Judgment in the United States District Court for the District of Columbia.

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United States Court of Appeals
District of Columbia Circuit
FILED JAN 7 1957
Joseph W. Stewart
CLERK

QUESTIONS PRESENTED.

The principal question in Appeal 13,612 is whether, in a suit to compel the issuance of a patent, the Distict Court was in error when, viewing an admittedly novel and utilitarian structure from hindsight, it found the improvement over the prior art apparent to anyone of ordinary skill, although the uncontradicted evidence shows the improvement solved the problem of adequate heat input which had long existed in the gas deep fat fryer field—to which the lack of a solution was even threatening to replace gas by electricity for fuel for deep fat fryers—and where the improvement produced striking and unexpected results in a highly competitive industry in a manner contrary to all the teachings of an active prior art.

The principal question presented in Appeal 13,613 is whether, in a suit to compel issuance of a patent, the District Court was in error in holding that appellant's drain structure does not meet the standards of invention, although the evidence shows that his structure is a substantial improvement over the prior art, that it satisfied a long existing need, and that it has been widely adopted and copied by the deep fat fryer industry.

In the

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT.

Nos. 13612-13613.

RICHARD T. KEATING

vs.

ROBERT C. WATSON, COMMISSIONER OF PATENTS.

APPEAL FROM A JUDGMENT IN THE UNITED STATES DISTRICT
COURT FOR THE DISTRICT OF COLUMBIA.

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Argument (No. 13612)

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STATUTE.

35 U. S. C., § 145 .... 1, 2

In the

United States Court of Appeals

FOR THE DISTRICT OF COLUMBIA CIRCUIT.

Nos. 13612-13613.

RICHARD T. KEATING

vs.

ROBERT C. WATSON, COMMISSIONER OF PATENTS.

APPEAL FROM A JUDGMENT IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF COLUMBIA.

PLAINTIFF-APPELLANT'S BRIEF.

JURISDICTIONAL STATEMENT.

Appellant's actions against the Commisisoner of Patents, seeking the issuance of two patents, arise under 35 U. S. C., Section 145 (App. 1, 6).*

Jurisdiction of the District Court is authorized by 28 U. S. C., Section 1338.

This Court has appellate jurisdiction to review a final judgment of a United States District Court dismissing the complaint (App. 14) under the provisions of 28 U. S. C., Section 1291.

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* "App." refers to the separately bound appendix to this brief. The portions of the record printed therein were stipulated by the parties.

STATEMENT OF CASE.

This is a consolidated appeal from a final judgment of the District Court for the District of Columbia (Hon. R. N. Wilkin, presiding) (App. 14), dismissing the complaints in two suits under 35 U. S. C., Section 145, against the Commissioner of Patents, seeking the issuance of two patents.

Richard T. Keating, plaintiff-appellant, a graduate engineer of Johns Hopkins University, has been president of an independent, deep fat frying equipment manufacturing company since 1939 (App. 17, 18). In 1950 the appellant submitted to the Patent Office two applications for patent (App. 67, 105), the subject matter of both relating to commercial deep fat fryers used in restaurants and hotels. On refusal of the Patent Office to issue the patents, the present actions were instituted (App. 1, 6). The District Court, while finding that "the evidence was quite clear that plaintiff's device was an improvement over prior fryers and that it had attained commercial success," refused to direct issuance of the patents on the ground that the improvements were obvious to those skilled in the art (App. 11).

The first application, Serial No. 197,035 (Pl. Ex. 1, App. 67) is generally directed to a structure of the gas fired heating element in a deep fat fryer.

The second application, Serial No. 197,036 (Pl. Ex. 2, App. 105) relates to the structure of the drain for removing fat and debris from the cooking vessel of a deep fat fryer.

In this brief the two applications will be treated separately in the order given above.

FIRST APPLICATION, SERIAL NO. 197,035.

Subject-Matter Involved.

Deep fat fryers have been in common use for many years. The popularity of deep fried food and the wide variety available—such as potatoes, shrimps, oysters and chicken—result in the extensive use of deep fat fryers in restaurants of all types (App. 19, 60).

One reason for the popularity of fried foods is that this type of cooking has its own distinctive taste, which is due, in some measure, to the food absorbing some of the fat while cooking (Pl. Ex. 7B, p. 26). Since some of the fat in which the raw food is cooked becomes part of the finished food, the fat must be clean, clear and free from any foreign taste. Potatoes fried in the same fat as a prior order of fish will not make for a satisfied customer if the potatoes absorb a "fishy" taste from particles of fish left in the fat (App. 19).

A deep fat fryer involves basically an open top cooking vessel containing fat with means to heat this fat to a temperature sufficient to deep fry food immersed therein (App. 19). Both gas and electric heating elements have been commonly used to apply heat to the fat (App. 38). The gas and electric heating elements are competitive in the industry (App. 139).

A wire mesh basket containing the food to be fried is immersed in the hot fat (App. 30). This allows the hot fat to freely circulate through the basket and contact all the food. Much of the food that is deep fried has a coating of flour or bread crumbs. As this food is immersed into the fat, particles of this outer coating fall through the wire basket into the fat (App. 19).

Early deep fat fryers had the heat applied externally to the bottom of the vessel containing the fat (App. 30). This proved to be unsatisfactory. The particles of the flour coating and bread crumbs that dropped from the food settled on the bottom of the vessel. These crumbs and slivers of food resting on the hot inside surface of the vessel burned and charred (App. 19). This burning and charring of the food particles discolored or contaminated the fat and adversely affected the taste of the foods to be cooked therein (App. 19).

In order to avoid these objectionable results, heat transfer tubes came into general use (App. 19). These consist of tubes immersed in the fat. They extend horizontally through the vessel and above its bottom (App. 19). A gas burner or burners placed on the front of the fryer projects a gas flame into these immersion heat transfer tubes with a flue or stack at the back of the fryer to allow the combustion gases to escape (App. 67). Since the heat transfer tubes are immersed in the fat above the bottom of the vessel, a portion of the fat lies below the heating elements (App. 19). Fat coming into contact with the heated tubes rises. The results of this is that the fat above the immersion tubes becomes very hot, leaving the fat below the immersion tubes, relatively cold (App. 19). The crumbs and particles of food in settling to the bottom of the vessel are in this relatively "cold zone" and thus do not burn or char (App. 19).

A thermostat for controlling the burners was in common use with the deep fat fryers to regulate the temperature of the fat (App. 54). It was normally calibrated to 400° F. which was the standard operating temperature used (App. 21). A thermostat merely fixed the maximum temperature at which the fat was to be heated. It has nothing to do with how the fat is heated or the rate at which it is heated (App. 47). The relatively small size of deep fat fryers imposed difficulties in heating the fat since it limits the space available for applying the heat (App. 124). The largest size Keating fryer has only a four square foot vessel (App. 28).

A gas deep fat fryer is not a mere mechanism for the generation of heat. It is a mechanism for the transfer of heat from a gas flame to the fat and then to the food. The heat must be transferred from the flame to a metal surface, through the metal and from the opposite metal surface to the fat. This involves principles of thermodynamics as well as heat transfer, both of which are complicated and theoretical in nature (App. 119; Pl. Ex. 7B). The use of immersion tubes created a serious problem of heat input to the fat. Difficulties in supplying oxygen to the gas flame in an enclosed tube as well as removing the products of combustion required a low rate of heat input (Pl. Ex. 7B, p. 79).

A problem in operating any fryer is the deterioration and chemical breakdown of fat under action of the high temperatures involved (App. 50). When fat breaks down, it becomes bitter and smokes easily and must be completely replaced (Pl. Ex. 7B, pp. 27, 28).

Fat deteriorates in proportion to the temperature at which it is heated (App. 45, 52). Fat at 400° F. is completely destroyed in twenty hours, even though 10% new fat be added (App. 31). If the temperature is kept below 337° F., the fat can be used indefinitely (App. 31).

Prior to the Keating fryer, the standard procedure was to have the thermostat of the fryer set from 375° to 400° F. (App. 21, 44). The standard thermostat setting used for the Keating fryer was 325° to 335° F. (App. 31, 38, 45), which is below the critical temperature of 337° F.

Replacing a vessel of fat is an important economic consideration to the restaurant operator. Top quality fat today costs about 22½ to 23 cents per pound (App. 32). As an example of the amounts involved, one Hogate Restaurant in Washington, D. C., used four Pitman Fryolaters (a gas deep fat fryer in the prior art) in a bank, each fryer using ninety pounds of fat; a total of 360 pounds of fat for just one bank of fryers (App. 45, 46).

Prior to the Keating structure there were three periods of time in the operation of all gas deep fat fryers: (1) heat-up time or pre-heat time; (2) frying time; and (3) recovery time (App. 21, 30-31).

The "heat-up" time was the time required to raise the temperature of the fat from room temperature, about 70° F., to operating temperature, 375° to 400° F., which was the conventional thermostat setting for frying operations (App. 30). The food was not lowered into the fat until this temperature was reached (App. 33). The shorter the "heat-up" time, the more flexibility the restaurant owner has in the use of his fryer, since he can turn it off between rush periods, knowing he can have it back in operation quickly when needed. Obviously, the restaurant owner saves fuel and has less fat breakdown (hence fat replacement) by turning the fryer off.

The "frying time" was the time required to cook the food after it was lowered into the fat (App. 31). This was the only productive period of the fryer.

The "recovery time" was the time which elapsed after the food was cooked and removed and before the fat was brought back to the thermostat setting (App. 31, 51). The immersion of a basket of cold food into fat heated to a temperature of 375° to 400° F. caused a drop of about 100° F. in the temperature of the fat (App. 33). During the frying period, the heat input to the fryer was sufficient only to raise the temperature of the fat gradually and could not make the fryer reach the thermostat setting until some time after the food was cooked and removed (App. 33). No fryer had a heat input capable of reaching its thermostat setting while the food was being fried (App. 39, 44, 51). This recovery period after the food was removed was lost time in the operation of the fryer (App. 33, 44).

If the restaurant cook did not wait during the recovery period until the fat was reheated to the thermostat setting, but instead, put in another normal load of cold food, the fat would suffer another drop in temperature of about 100° F., and if the performance was repeated there would be a progressive lowering of the temperature of the cooking fat as each successive cold batch of food was immersed (App. 33, 44, 51). The cold fat would result in poor quality food (App. 47, 51).

The only alternative the cook had was to decrease the quantity of food in each successive basket so as to lessen the temperature drop caused by its immersion (App. 33). The quality of the food would then depend upon this juggling by the cook and his skill and judgment in lightening the load according to his guess as to the temperature of the fat at the particular moment (App. 47).

Prior Unsuccessful Efforts to Provide a High Performance, Thermally Efficient Gas-Fired Deep Fat Fryer.

The inadequate rate of heat supplied to the fat by gas deep fat fryers to properly fry foods in commercial quantities had long been a real problem to the users of deep fat fryers and to the gas appliance industry (App. 119; Pl. Ex. 7B). At least since 1936 when the Childs and O'Dowd applications were filed, efforts were aimed at devising some means of transferring more heat to the fat (see patents to Childs' O'Dowd and Kells, Pl. Ex. 3-B, 3-C and 3-D, respectively, App. 147, 155, 169). The problem was not solved.

Vocal dissatisfaction by deep fat fryer users was not all the gas appliance industry faced. Electrically heated deep fat fryers had reduced the recovery time greatly (App. 139). Since there are no products of combustion when electricity is consumed and less heat transfer problems, it is a relatively easy matter to increase the heat input in an electric deep fat fryer (Pl. Ex. 1). Because this increase of heat input resulted in faster operation, users of deep fat fryers were switching to electrically heated fryers (App. 139). Heat input to the fat from a gas flame is much more complicated. Heat from a gas flame must be transferred through air to a metal surface, through the metal, and from the metal surface to the fat (Pl. Ex. 7-B, p. 35). Another factor is that there must be almost complete combustion of the gas in order to secure a reasonably high efficiency (Pl. Ex. 7-B, p. 16).

The gas fryer industry was very active in attempting to solve this heat input problem. Baffles and fins were placed on the inside and outside surfaces of the immersion tubes in an attempt to extend the heat transfer surfaces (App. 119, Pl. Ex. 7-B). Another method used was to resort to tubes having return bends and multiple passages in the fat, such as shown in the Childs patent issued in 1939 (App. 147). The O'Dowd patent, filed in 1936 and issued in 1939, used elongated tubes to secure more heat surface area in the given space (App. 155).

O'Dowd says with respect to these tubes (p. 2, col. 2, lines 39-47):

> "The vertically elongated shape of the heating flues b^5 permits their being spaced apart laterally so that each is surrounded by a large body of liquid to absorb heat and, because the heating surface presented by the flues is so great, the entire body of liquid in the vessel B can be rapidly brought to the desired cooking temperature without being superheated at the point of application of the heat."

The Kells patent (App. 169), filed in 1942 and issued in 1947, was a more concrete example of this view of increasing the heating surface area. The District Court found that it had for its object a high rate of heat generation (App. 13).

Kells describes his tube construction as follows (col. 3, lines 55-61):

> "The heat exchange tubes 23 have various cross-sectional configurations in accord with the concepts underlying the above mentioned objects of my invention. Generally speaking, the tubes should be relatively narrow and relatively deep in cross-section, thus providing relatively extensive vertical surfaces."

This patent showed eight narrow tubes in order to squeeze in as much vertical heating surface as possible. Obviously, for a given width of fryer a greater number of narrow tubes can be utilized than larger sized tubes (App. 134).

None of these methods succeeded in increasing the heat input sufficiently to substantially speed up fryer operation (App. 44, 51).

The problem of adequate heat input to the fat in gas deep fat fryers became so critical, as the challenge to gas by electricity grew, that the American Gas Association Laboratories made two extensive studies on heat input to deep fat fryers and published their results in a 31 page research bulletin in 1944 and a 105 page research bulletin in 1952 (Pl. Ex. 7-A and 7-B, App. 119, 136).

The American Gas Association is an organization of gas companies and affiliated groups such as gas appliance manufacturers (App. 22). The Association maintains a research organization to devise and test experimental models of gas appliances, and also to run tests on the utility and acceptability of equipment manufactured by others (App. 23).

The choice of which problems the Laboratories of the American Gas Association shall do research is a selective one. The Committee on Industrial and Commercial Gas Research of this Association determines which of all the problems facing the gas industry shall be the subject of a research project (App. 121, 138-139). The Committee is composed of distinguished men in the gas industry—leaders in their field. Just a glance at the Committee during 1944 and 1952 with their titles in their respective companies clearly indicates they are leaders in the gas industry (App. 120, 137).

A superficial examination of Research Bulletin #24 (App. 119) will indicate the comprehensive and detailed nature of the study necessary to prepare it. Its stated purpose was "* * * to determine the possibilities of improving heat transfer rates in deep fat fryer immersion tubes notwithstanding inherent difficulty presented by limited heat transfer area" (App. 124). This research group concluded that "Results of research on optimum shape and baffling for short immersion tubes clearly indicated that the heating surface in deep fat fryers must be increased greatly beyond that of contemporary models to attain marked improvement in heating speed with high thermal efficiency" (App. 134).

All the prior art—both patents as well as research studies—taught that to increase the rate of heat input there must be an increase of the heating surface (App. 134).

The Keating Disclosure.

Keating departed from the teachings of the prior art which had attempted to insert as much heating surface as possible into the fat (App. 68). Keating sought a better relationship of combustion space to heating surface (App. 67). Compared to gas deep fat fryers that were in use, Keating's model decreased the total heating surface area (App. 65). Keating attacked the heat input problem by providing better heat transfer from the flame to the inside surface of the immersion tube (App. 68). The prior art had attacked the problem from heat transfer from the outside surface of the tube to the fat (O'Dowd App. 166, p. 2, col. 1, lines 27-30; Kells App. 171, col. 1, lines 37-42). The exhaustive study into the fundamentals of deep fat fryers by the A. G. A. Laboratories Research Bulletin #66, published in May 1952 (Pl. Ex. 7B) proved Keating's analysis correct by proving the heat transferred from the fat side of the immersion tube to the fat was 6 to 10 times as fast as from the flame to the inside surface (p. 40). It is the heat transferred from the flame to the inside tube surface that is the controlling resistance to heat input to the fat (Pl. Ex. 7B, p. 40).

Keating discloses in the present application a specific structural relationship of parts, more particularly a specific ratio between the volumetric capacity of the heating space within the heating tubes to the surface area of the cooking vessel and to the surface area of the combustion tubes themselves (App. 67).

The ratio of the volumetric capacity of the combustion space in the tubes to the surface area of the cooking vessel is substantially 2.8 to 1 as defined in certain claims, and between 2.5 to 1 and 3 to 1 as defined in other claims (App. 73-75).

The ratio of the combustion space in the tubes to the surface area of the tubes is approximately 1 to 1 (App. 73-75).

All models of Keating's fryers are made in accordance with these ratios (Pl. Ex. 9, App. 141).

The Keating Claims.

The eight claims in the first Keating application, which were rejected by the Commissioner, are set out in full at App. 73-75. Claim 1, which is typical, is as follows:

> "A deep fryer comprising, in combination, an open top cooking vessel, with a plurality of horizontal combustion tubes extending transversely through the interior of the vessel but spaced substantially above the bottom and below the top thereof; said tubes being of oval configuration with their height greater than their width and having internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of the cooking vessel, yet having substantially one square inch of surface area per cubic inch of combustion space."

The Results Obtained by Keating.

The results obtained by the Keating fryer radically altered the deep fat fryer industry. The Keating fryer completely eliminated the third time phase in deep fat frying operation, namely, the recovery time (App. 29, 38, 43). The Keating structure was the first gas fryer to reheat the fat with normal loads and satisfy the thermostat setting before the food was cooked (App. 44). Keating and three widely experienced, disinterested witnesses so testified, Mr. John Daniels, Vice-President of Hot Shoppes, Inc., Mr. Watson Rulon, Manager of Hogate's Seafood Restaurants, Washington, D. C. and Arlington, Virginia, and Mr. Edward Fineran, Manager of Industrial Sales of the Washington Gas Light Company, Washington, D. C. (Daniels, App. 38; Rulon, App. 43; Fineran, App. 51; and Keating, App. 32-34).

The benefits of eliminating the recovery time to the restaurant operator were two-fold: (1) the cook could automatically turn out batch after batch of high quality products with no waiting period; and the quality of food is not determined by the cook's guessing as to how large a second or succeeding batch the fryer could take (App. 44); and (2) he obtained more productivity from his fryer since no waiting period was required between filling orders for the fat to revert to its operating temperature.

The pre-heat time in the Keating fryer is 7½ minutes from 70° F. to 375° F. (App. 32), which is an advance of 293% in efficiency over certain conventional types of fryers chosen as clearly representative of the prior art, and an improvement of over 140% over the next most efficient fryer known (App. 67, see Kells Patent, App. 169, Col. 5, line 71). The importance of pre-heat time or heat-up time to the restaurant operator was mentioned previously on page 6.

The Keating fryer operates at a thermostat setting of from 325° F. to 335° F., as compared to the prior conventional setting of 375° F. to 400° F. (Keating, App. 31; Daniels, App. 38; Rulon, App. 45; and Fineran, App. 52). This lower setting and resulting lower maximum operating temperature of the fat is below the critical 337° F. mentioned previously which results in much less deterioration of the fat and hence in a great fat saving (App. 31-32; 39; 45; and 52).

The trial judge found the evidence clearly shows Keating's device was an improvement over the prior art and commercially successful (App. 11).

Patent Office's Denial of Patentability.

In rejecting the application, the Examiner and the Board of Appeals relied upon the following patents:

O'Dowd—No. 2,182,735, issued December 5, 1939 (App. 155).

Kells—No. 2,429,360, issued October 21, 1947 (App. 169).

Both of these patents show conventional open top frying vessels with gas-fired heat transfer tubes extending horizontally within the vessel and spaced above the bottom of the vessel (App. 12, 13). Both desired to introduce greater heat to the fat by using more vertical heating surfaces (O'Dowd, App. 155, col. 2, lines 39-47, and Kells, App. 169, col. 3, line 55 to col. 4, line 4; col. 6, lines 11-32).

The Examiner's position was that Keating failed to show the criticality of his ratios and that the difference in structure produced unexpectedly good results (App. 77, 80-81). In his statement to the Board of Appeals, he took the same position (App. 84-85).

Upon production of affidavits by Keating, proving his results (App. 91-94), the Board of Appeals decided that the obtaining of these results was obvious and that Keating's work was "merely the result of the routine tests necessary to determine the optimum relationship" (App. 100).

Throughout the trial the Patent Office took the position that the use of the thermostat on the fryer was the solution to the whole problem involved (App. 34-36; 39-42; 46-48; and 54).

STATUTES INVOLVED.

The primary statutes involved are Sections 101, 102 and 103, 35 U. S. C., reproduced at the end of this brief.

STATEMENT OF POINTS.

The District Court erred in action No. 2321-54 (Appeal 13612):

(1) In holding that the admitted improvement was apparent to anyone of ordinary skill when the uncontradicted evidence showed it solved a known problem that had long existed despite intensive research studies by design engineers;

(2) In holding that the admitted improvement was a change of degree of the prior art and not original when the uncontradicted evidence showed it not only did not follow the teachings of the prior art but was contrary to them;

(3) In holding that the accomplishments of the Keating structure were not sufficient to merit the granting of a patent where they were so impressive and unexpected that the device was an immediate commercial success and is widely used;

(4) In holding that there was insufficient evidence to overcome the presumption in favor of the Patent Office to establish the patentability of the eight claims of the application where the evidence showed the Patent Office did not understand the inventive features of the structure.

The District Court erred in action No. 5540-55 (Appeal 13613):

(1) In holding that the Keating drain structure, though clearly an improvement over the prior art and achieving beneficial results, was apparent from the prior art to any man of ordinary skill where the evidence showed the problem solved had long existed and that the Keating structure was being widely copied in the field.

SUMMARY OF ARGUMENT.

On Appeal No. 13,612:

Appellant's admitted improvement satisfied a long existing need for adequate heat input in the highly competitive deep fat fryer field. Long prior to appellant, the deep fat fryer industry adopted gas-fired tubes immersed in the fat because these tubes provided a "cold zone" below them where crumbs and food particles collected and did not burn. Burned food particles spoiled the fat. However, immersion tubes created a serious problem of inadequate heat input, *i. e.,* transfer of heat from the flame to the metal tube, through the metal to the fat, and thence to the food. This is the problem which appellant solved.

The prior workers in the field sought to solve the problem by increasing the surface area of the tubes, and also by the use of fins and baffles to give larger heating surfaces. Tubes of various shapes in cross-section were tried. Also, tubes with multiple passages through the fat were used. These workers included the engineers of the American Gas Association Laboratories. The problem remained unsolved.

Appellant went contrary to the prior art thinking. He decreased tube surface, but taught a specific ratio between the combustion space within the tubes and the surface area of the tubes; also a specific ratio between the surface area of the tubes and the area of the top of the cooking vessel.

The uncontradicted evidence shows that appellant made a remarkable advance, and achieved new, surprising and unexpected results in heat input. Among these are a completely new time cycle in deep fat frying, a virtually automatic frying operation, and a new frying temperature (substantially lower and providing substantial fat savings). Appellant's fryer received immediate acceptance by the hotel and restaurant trade.

Appellant's advance clearly meets the standards of invention.

The Patent Office failed to understand the problem and appellant's solution. This is evident from the inconsistent positions taken within the Office.

The attorney for the Commissioner failed to understand the problem, as is evident from his cross-examination of appellant's witnesses during the trial.

The District Court found improvement, but must have been misled by the counsel for the Commissioner.

It is easy to understand the reason for the misunderstanding. These devices of appellant and the prior art appear to be similar; they are made of metal, they consist of a vessel and multiple heat transfer tubes. A mere superficial examination of these devices would leave the impression that they are the same.

Appellant's device uses no more metal, uses no more tubes, uses no more parts, and appears very similar but here the similarity ends.

The performance of appellant's device is vastly different and unbelievable to anyone just examining the fryers. The fryers must be actually used for this difference to become apparent.

For this reason the witnesses for appellant are experts who are in a far superior position than the experts of the Patent Office. These experts who testified for appellant knew of their own first hand knowledge what the presumed experts of the Patent Office did not know or could not believe. They were witnesses testifying to fact, not theory.

The three most outstanding men in their respective fields in the city of Washington testified that appellant's device is different, that it establishes a new frying cycle, that it makes possible the use of lower frying temperatures and that the device does what no other fryer ever did before.

John Daniels is vice president of the largest chain of restaurants in the District of Columbia and environs, "The Hot Shoppes". Watson Rulon is general manager of an acknowledged outstanding independent restaurant, "Hogate's". E. V. Fineran is industrial gas manager of the Washington Gas Light Company, which supplies gas to all of the restaurants in the District of Columbia area.

These witnesses are experts with specific, practical knowledge.

It must be understood that there is a difference between "heat" and "temperature": temperature is a measure of the amount of heat at a given time. A thermostat merely controls temperature. The Patent Office's view, at least in the District Court, was that the thermostat setting in a deep fat fryer does everything. It chose to disregard the time element in the sequence of operation. The thermostat causes more heat to be supplied (whether efficiently or not). It does not control how fast the heat is supplied, *i. e.*, rate of heat input. Appellant's disclosure is one step beyond the thermostat control. When the thermostat says "more heat is needed", appellant's structure is concerned with how it is supplied and how fast. This the Patent Office chose to ignore.

The matter of heating a fryer might be compared to heating a house. When a basket of cold food is immersed in a deep fat fryer, the fat cools off rapidly. Its temperature drops about 100° F., just as the temperature of a house would drop about 100° F. if all of the doors and windows were thrown open to an outside temperature of 40° F. below zero.

With the old fryers it was necessary to fry the food to completeness, remove it from the frying fat, and then wait for the fat to heat up again. With a house at an outside temperature of 40° F. below zero, it would be necessary to close the doors and windows and wait for the house to reheat again.

With appellant's device, the fat reheats while the food is frying. It may be compared to a house which is warm and comfortable with the doors and windows wide open at 40° below zero outside, or at least is warm and comfortable the very instant the doors and windows are closed.

Whether or not this could be done with a house is of little consequence, since there is room in a house for more and larger heating devices. There is no room in a fryer for such larger devices for heating the fat.

The uncontradicted evidence compels these conclusions:

1. Appellant's device does what no other fryer ever did before.
2. Appellant's device establishes a new frying cycle.
3. Appellant's device establishes a new frying temperature far below that possible with any known fryer resulting in extension of the life of the frying fat.
4. The prior art struggled with this problem and failed.

The evidence shows that appellant is entitled to a patent.

With respect to Appeal No. 13,613:

Appellant's second application, relating to the drain construction of a deep fat fryer, provided a substantial improvement over the prior art, particularly with respect to its non-clogging feature. Appellant discloses a bottom in his cooking vessel which provides, with the drain spout, a continuous chute so that slivers of food in the fat are aligned with the drain opening. The prior art drains were so constructed that "log jams" frequently occurred at the entrance to the drain. Also, appellant was the first to provide for straining of the fat directly on the drain spout. In addition, in appellant's device it is unnecessary to move the fat pail horizontally; as a result, the danger of the cook's being splattered by hot grease is for all practical purposes eliminated. Appellant's structure, which was not taught by the prior art and never commercially used, has been freely copied by competitors since its introduction by appellant. Appellant's device warrants patent protection.

ARGUMENT.

I. THE APPELLATE COURT HAVING WIDE DISCRETION TO REVIEW A DISTRICT COURT'S DECISION ON THE GRANTING OF A PATENT, SHOULD REVERSE THE DISTRICT COURT WHERE ITS FINDING SHOWS IT OVERLOOKED THE INVENTIVE FEATURES OF APPELLANT'S STRUCTURE AND WHERE ITS FINDINGS ARE CLEARLY INCONSISTENT WITH THE EVIDENCE PRESENTED.

A. Appellant's Novel Improvement Satisfied a Long Existing Need for Adequate Heat Input in the Highly Competitive Deep Fat Fryer Industry and Produced Such Impressive Results That It Enjoyed Wide Commercial Success.

1. Restaurant Owners' Need and the Gas Industry Problem.

The use of immersion tubes for heating the fat of deep fat fryers eliminated the charring of food particles, but it created a serious problem of adequate heat input to the fat (App. 121). For efficient as well as non-hazardous operation the fuel must be almost entirely consumed to keep carbon monoxide to a minimum. Since the combustion of the fuel takes place in an enclosed tube, difficult problems are created for supplying sufficient oxygen as well as removing combustion products. To minimize the dangers of poor combustion, immersion tubes had to be operated at low heat input (Pl. Ex. 7B, page 79).

This limitation of immersion tubes seriously affected the restaurant owner. To him heat input is not a technical concept, but of vital, practical importance. He wants and needs a fast operating fryer. The faster the fat can be heated to operating temperature the more use the restaurant owner can get from his fryer. As a businessman his criterion of a "good" deep fat fryer is the rate of satisfactory fried food at the lowest cost. He cannot wait unduly long to fill an order or else the customer is dissatisfied, but above all he must serve satisfactory food or the customer is certainly lost.

This is the crux of the case. Keating does not claim to be the first person to make fried food or to introduce heat to the fat although this seemed to be the view of the Patent Office during the trial. Heat had always been supplied to the fat to obtain operating temperatures but at very low rates—*i. e.,* in a given period of time how many units of heat were transferred to the fat: BTU per hour. It is the introducing of the heat quickly—the rate of heat—that Keating, by using a new concept, was the first to surmount the problems involved and obtain a practically automatic frying operation. The District Court as well as the Patent Office by ignoring or overlooking the time factor involved failed to see the inventive features of the Keating structure over the prior art.

The record shows the fastest operating prior art fryer had a preheating time of 14 minutes, 10 seconds (App. 25) forcing the user even during lulls in business to keep his fryer in constant readiness at the high operating temperature of 375-400° F. The record shows every prior art gas fryer had a recovery time—*i. e.*, the fryer had not returned to its operating temperature when a batch of cooked food was removed (App. 44).

The restaurant operator was faced with a dilemma. He could either wait (also keeping customers waiting) to allow the temperature of the fat to rise to the desired initial operating temperature to secure the best quality food, or else place more food in the lower temperature fat, thus securing greater output but of a poorer quality.

Mr. Rulon, Manager of the two Hogate Restaurants, gave his views on the dilemma facing the restaurant operator. He testified (App. 44).

> "Let's assume that the temperature attained to start with was up in there (referring to his previous statement on a thermostat control setting of 375-400° F.). We put a cooking load in and it would come down. Before the thermostat ever came on the food had been cooked. Then without a waiting period, if the cook put another load in we stepped down here again and it was a constantly losing game of cooking temperature. Say on an hour's peak load, or less than an hour, we would get down into a very low grade cooking zone, never having attained the original desired temperature. *This could be done if we waited, but when you get production you cannot wait. It was constantly a compromise with time and temperature.*" (Emphasis supplied.)

Mr. Fineran, Industrial Sales Manager of the Washington Gas Light Co., having eighteen years' experience with commercial deep fat fryers, testified to his views as to the problem facing the restaurant operator (App. 51):

> "When a full load of food was placed in the older model fryers, by the time the food was done the temperature of the frying compound had not yet reached the temperature from which it started when the food was placed in the fryer. Therefore, if the user immediately put a second load of food in the fryer there

> was a step-by-step dropping in the frying temperature of the fryer with poor results on the finished product of the food."

That the restaurant operator should be faced with a choice of sacrificing quality for output was clearly an intolerable situation. The uncontested evidence shows that despite many attempts not one fryer prior to the Keating structure was able to solve this need (App. 51).

Yet the Patent Office chose to disregard the operator's dilemma or treated it as trivial by looking at it as an abstract matter. The Patent Office's view, at least at the District Court's level, was that the thermostat setting does everything. It disregarded the time element in the sequence of operation of the deep fat fryer: heat input meant temperature. As long as the fat could be heated by immersion tubes to operating temperature—say 400° F.—it was immaterial to the Patent Office whether it took five minutes or five hours. The sequence of questions asked Mr. Fineran on cross-examination (App. 54) is indicative of the Patent Office's complete avoidance or unawareness of the problem facing the fryer industry. The thermostat control merely regulates temperature. The thermostat supplies more heat when needed but is not concerned in the least with how the heat is supplied (whether efficiently or not) or how fast the heat is supplied (rate of heat input). The Keating disclosure is one step beyond the thermostat control. When the thermostat says "more heat is needed", the Keating structure is concerned with how it is supplied and how fast. The Patent Office emphasis on the thermostat control is completely irrelevant to the Keating disclosure and ignores the importance to the restaurant owner of providing sufficient heat input to the fat in a short enough period of time to eliminate the recovery period. It is a clear indication that the Patent Office entirely misunderstood the inventive features of Keating's structure and misled the District Court in its holdings.

Mr. Daniels, vice president of Hot Shoppes, and Mr. Rulon, manager of Hogate's Restaurants in Washington and Virginia, both in the restaurant business for many years, testified in response to questioning by the Patent Office that they were not getting "satisfactory" or "acceptable" food from prior art fryers. Mr. Rulon testified in response to the question:

> "And you could make acceptable fried potatoes with those fryers, could you not?
>
> A. I surely don't want to quibble on the word 'acceptable'. It was the best food that we could turn out at the time, but to be firm, it was not of the quality that we are able to turn out today" (App., p. 46).

Like any other businessman, the restaurant owner is interested in decreasing operating costs. The replacement of fat is an important economic consideration since it costs about 23¢ per pound with 90 pounds being used in prior art fryers (App. 45). It was clearly evident to the fryer industry that keeping fat below 337° F. would extend fat life indefinitely (App. 31), yet in all fryers the operating temperature had to be kept between 375-400° F. (App. 51), requiring complete replacement of the fat every twenty hours. This high operating temperature was required due to the low heat input of the prior art fryers, to somewhat offset the large initial drop of temperature of the fat when cold food was immersed.

The problems faced by the deep fat fryer users due to insufficient heat input were serious and they were real. The Patent Office as well as the District Court failed to see the problems involved in increasing heat input to fryers or the benefits to be obtained when they were solved because they failed to view events from the point of view of the fryer industry.

2. The State of Prior Art—Attempts to Satisfy This Need in Gas Fryers.

As in any competitive industry many and different attempts were made to solve the problem of the low rate of heat input. In a patent issued in 1927 Pitman used baffles in his immersion tubes in an attempt to get more heat from the gas flame to the fat (App. 143). In a patent filed in 1936 and issued in 1939 Childs attempted to use return bends to induce more heat from the gas flame to the fat (App. 147). O'Dowd and Kells increased the vertical heating surface area in an attempt to increase the rate of heat input to the fat (App. 147, 169). The record shows that none of these methods succeeded in increasing the rate of heat input to a gas fryer to satisfy the thermostat setting before the food was cooked and removed (App. 44). In other words the operation of every known prior gas fryer included a recovery time.

As long as there was not any fryer capable of providing adequate heat input to a fryer to satisfy the restaurant owners' need by eliminating the recovery time, the problem facing the gas industry while irritating was not critical.

From the testimony of Mr. Daniels (App. 38), the electric fryers had almost, if not completely, solved this problem. In a competitive industry this can only mean a gain of customers for electrically heated fryers with a resulting loss in users of gas fryers.

The potential loss of a large amount of users of gas deep fat fryers was a critical problem and the gas industry treated it as such. This can be seen from the "History and Objectives" section of the 105 page Research Bulletin No. 66 of the American Gas Association "Design Studies of Gas Deep Fat Fryers.":

> "Over a period of years, popularity of foods prepared by deep fat frying methods has grown considerably.

> A great deal of this increased popularity may be traced to contain improvements in gas deep fat fryers. *In recent years, however, there has been evidenced an increasing demand for deep fat fryers with faster cooking and recovery speeds. This demand has been sharpened by the competition from electric appliance manufacturers who claim superior speed for their equipment*'' (emphasis added).
>
> ''In attempting to meet this challenge from increased cooking speed, it is apparent that any improvement must be obtained without causing detrimental effects on the life of the cooking medium, life of the kettle, and life of the appliance in general. *These problems were not readily solved because basic information on many important design factors had not been generally available*'' (emphasis supplied) (App. 139).

The Laboratories combines the research efforts of the largest gas producers and distributors as well as the gas appliance companies of this country. Besides the regular members of the Laboratories' staff who conduct the experimental work, assistance is given when needed by the gas appliance manufacturers (App. 121). The research bulletins are the result of work of not only the ordinary man skilled in the art but some of the best gas engineers in the world.

A study of the A. G. A. Laboratories Research Bulletins Nos. 24 and 66 (Pl. Ex. 7A & 7B; App. 119, 136) issued in March 1944 and May 1952 respectively, compels the conclusion that there was a serious and long existing problem of thermal inadequacy of gas fired deep fat fryers. The extent and magnitude of the research efforts are apparent from these bulletins.

Even the most superficial glance at Research Bulletin 24 (App. 119) on immersion tube heating, will show it to be a comprehensive study with a decided engineering approach. Besides the engineers on the Laboratories staff, assistance was obtained from firms that make gas fryers

(App. 121) with at least one (O'Dowd assignee) whose fryer the District Court and the Patent Office say make it "obvious" to those skilled in the art to do what Keating has done.

This study was specifically made to determine better ways to improve the rate of heat input to the fat:

> "The purpose of this investigation was to determine the possibilities of improving heat transfer rates in deep fat fryer immersion tubes notwithstanding inherent difficulty presented by limited heat transfer area" (App. 124).

It is thus seen that prior to 1944 the problem of adequate heat input to deep fat fryers must have been so serious a problem facing the commercial gas industry that the Committee on Industrial Gas Research, composed of leaders of the entire gas industry, selected it in preference to other topics as a subject for research.

The American Gas Association Laboratories concluded in March 1944 that the answer to the problem of increased heat input to the fat was to increase the heating surface (App. 134).

The Kells patent (App. 169) teaches the same principal —to provide a high rate of heat input (App. 13) increase the vertical heat transfer area. Among the objects of his invention, Kells lists:

> "* * * to provide relatively extensive areas for heat exchange; * * * to provide extensive heating areas that are for the most part vertical surfaces" (Col. 1, lines 32-37).

At the end of his description, after comparing the rate of heat input in his fryer to a prior art fryer, Kells says:

> "* * * This comparison emphasizes the gain in total area for heat exchange achieved by using relatively narrow tubes for extensive vertical areas" (Col. 6, lines 21-24).

Kells carries O'Dowd's teaching to its logical finish. He saw that in a given width of fryer in order to increase the heat surface area of immersion tubes he would have to make the tubes narrow in order to squeeze more in. He crammed eight narrow tubes in a 14″ x 14″ fryer. The A. G. A. Laboratories having the active assistance of the O'Dowd assignee saw this also. In their testing of different shapes of tubes, they concluded that a 2″ diameter circular tube yielded greater heat output than the elongated shaped tubes, but for a given cooking vessel the greatest heat output was obtained using narrow elongated shaped tubes since a greater number, with resultant increase in heat transfer area, could be employed in a given width (App. 124-125).

In the Court below the appellant produced a physical model (Pl. Ex. 8) which was strikingly similar to the disclosure of the Kells patent (App. 24 and 25) Keating testified that fryers such as plaintiffs' exhibit 8 were made and sold commercially by the Wolff Range Co., and that he was familiar with them during the period from 1944 to 1947. Concerning his tests on this model, Keating testified (App. 24-25).

> "I filled the fryer with fat. I sized the gas burner orifices so that I could get the maximum heating effect.
>
> "The pre-heat time for this device was 14 minutes and 10 seconds; the frying time was 7 minutes and 5 seconds for a 5 pound load of potatoes; and the recovery time was 2 minutes and 45 seconds to heat the fat up to the starting temperature."

The results obtained from Kells patent should be more aptly termed "an improvement over the art" since the problems facing the gas deep fat frying industry were helped but a little and certainly not solved. Yet a patent was issued on the Kells fryer. Keating by using an entirely different approach, contrary to Kells' teachings, eliminated the problem altogether. The Patent Office claims this is merely an improvement.

At the time Keating introduced his fryer the prior art, both patent and practice, believed in order to heat the fat faster they had to cram as much heating surface as possible into the vessel. Mr. Rulon in describing the fryer (Pitman Fryolater) that Hogate's restaurant was using prior to Keating said:

> "Well, it was the same essential immersion type unit; the tubes running through a container, passing heat through their surface into the surrounding fat. *It was crowded with tubes always, as many as they could physically jam into the tube sheet*" (App. 43) (emphasis added).

Research Bulletin No. 66 (Pl. Ex. 7-B) published in May 1952 by the A. G. A. Laboratories, has 105 pages of design analysis of gas deep fat fryers. The failure of the gas deep fat fryer industry to develop a fryer having increased heating speed characteristics to compete with the electrical fryers despite the O'Dowd and Kells patents necessitated another study on heat input to gas deep fat fryers by the A. G. A. Laboratories. This scientific group having unlimited means at its disposal was forced to investigate twice the problems of gas deep fat frying in order to seek a method of increasing the heat input to the fat. They were compelled to do so by the success of the electric fryers in solving this problem.

> "These studies were *aimed at overcoming, if possible, the inadequacies of heavy-duty gas fryers where they competed with those heated with electricity.* These procedures should make possible the design of gas fryers which can compete successfully with contemporary electric fryers. If desired, the designer may strive for even greater performance; however, *in fryers, as in everything else, the last little bit extra is often difficult to achieve*" (Pl. Ex. 7-B page 10) (emphasis added).

This scientific group at the Laboratories realized the difficulties involved in securing better heating characteristics in deep fat fryers with immersion tubes. In their Evaluation of Factors Affecting Application of Heat to Deep Fat Fryers (Research Bulletin No. 66, p. 79), they expressed the design difficulties involved in heating fat by immersion tubes:

> "From the results of early fryer tests, it appeared that burners designed to operate within immersion tubes must be operated at low heat inputs, simply to minimize the dangers of poor combustion. Low input is an excessive penalty to pay for the use of a fryer design which also has other serious operating disadvantages. Test work done on gas-fired immersion tubes, such as the studies described in A. G. A. Laboratories' Research Bulletin No. 24, 'Research in Fundamentals of Immersion Tube Heating with Gas', March 1944, give *ample data on the difficulties of designing a pure immersion tube fryer with adequate heat transfer areas and adequate combustion space within the tube.*"

The testimony of Daniels, Rulon and Fineran, as well as the testimony of Keating, establishes that prior to Keating and despite the efforts of the best brains in the industry, no one has produced a deep fat fryer with a sufficient quantity of heat transmitted to the frying fat to satisfy the user's need. Daniels, Rulon and Fineran were financially disinterested witnesses (App. 37, 42, 50). They were men of stature, competence and experience in their respective fields. Daniels, as Vice-President of Hot Shoppes since about 1942, has been connected with the operation of some sixty restaurants, as well as industrial and airline feeding operations, spread over a large area of the country (App. 37). Mr. Rulon for eighteen years has been Manager of the well-known Hogate's Seafood Restaurants in Washington, D. C. and Arlington, Virginia (App. 42).

Mr. Fineran, a graduate gas engineer from Johns Hopkins University, is Industrial Sales Manager of the Washington Gas Light Company, Washington, D. C. (App. 49).

3. Appellant's Structure Using New Concept Satisfied Need and Eliminated Problem.

Keating ignored the attempt to squeeze as much heating surface into the fat as possible, instead he saw that a better relationship between the combustion space and the surface area was the critical factor. Whereas the prior art had thought the difficulty in supplying an adequate rate of heat from immersion tubes to the fat lay in the heat being transferred from the metal to the fat (thus sought to increase the heated surface area immersed in the fat), Keating sought a better method of transferring the heat from the flame to the tube. He was the first to do this. In attacking the heat supply problem from this view, he designed a tube that gave maximum heat transfer to the inside surface of the tube while allowing for adequate combustion product removal.

Not only is Keating's structure not apparent from all the teachings of the prior art but it is contrary to them. Instead of increasing the heating surface he decreased it (App. 65). Kells' preferred embodiment discloses 714 sq. inches total heating surface (App. 173; Col. 6, line 15), whereas Keating has only 563 sq. inches (App. 65).

All of the claims of the application specify a new and novel type immersion tube having a definite relationship between combustion space and surface area (App. 73-75). The record is abundant with testimony and affidavits of disinterested users of fryers showing the Keating structure was successful in eliminating their problems and satisfying their needs. The elements of Keating's structure co-acted to bring about a cycle of operation never before achieved. The recovery time was eliminated and the restaurant owner's needs were satisfied for a fast operating fryer. The record plainly shows the individual elements of the Keating fryer acted differently from those in any prior art structures and thus exceeded the sum of its parts.

The eight claims of Keating's application specified a fryer achieving results never before attained. Keating accomplishes this by designing the heat transfer tubes in such a manner as to eliminate all the problems heretofore preventing success by going contrary to the teachings of all the prior art. The immediate commercial success of his fryer confirms the fact that it was an important advance in the art of deep fat fryers, satisfying a long-felt need.

4. Appellant's Structure Produced Such Impressive and Unexpected Results That It Enjoyed Immediate Commercial Success.

The results obtained from the Keating device made a real impact on the deep fat fryer industry. The Keating structure gave results that were so clearly superior to any that preceded it that the trial Court was obliged to admit that the Keating "device was an improvement over prior fryers."

Men of long and active experience in the restaurant business, having intimate knowledge of fryers, testified to the outstanding results obtained from the Keating device. Great weight should attach to the testimony of these disinterested witnesses.

The outstanding results of Keating are:

1. New cycle of frying;
2. Better quality of fried food;
3. Remarkable advance in pre-heat time;

4. Greater quantity of quality food produced per unit of time; and
5. Use of lower frying temperature.

(1) *New cycle of frying.*

The Keating device eliminated the recovery period completely by combining it with the frying time. For the first time a two-part cycle was made possible, namely, pre-heat and frying time (App. 43).

Keating contributed the first fryer capable of continuous frying of normal food loads. Before the food was cooked and removed from the fat, the Keating structure was able to transfer so much heat to the fat that the thermostat was satisfied. As soon as one batch of food was removed, the fryer was at its optimum thermostat setting ready for the next batch.

(2) *Better quality of fried food.*

The elimination of the recovery period in the fryer sequence of operation resulted in better quality food being served to customers. Mr. Rulon testifying about the benefits derived from the Keating fryer said "* * *; so economically they offer great advantages, but primarily the quality of the food is superior to anything we were able to obtain with the preceding fryers" (App. 45).

For consistent, satisfactory fried food in a commercial establishment, the sequence of operation should be the same. Each batch of food should cook the same as the previous batch. It is extremely desirable that a cook in a restaurant during busy periods know exactly the length of time the food is required to be cooked to get a satisfactory product. During the frying period the cook is doing the countless things required of him in a busy restaurant kitchen. He wants to know that a certain time after placing, say, potatoes in the fat at 400° F., he will take the potatoes out and have an order acceptable for serving to a customer. In no fryer could this be done previously. Upon removal of the food from the fryer, the temperature of the fat was always below the optimum temperature. Due to this continual drop in temperature, there was no certainty as to the length of frying time that would give an acceptable product. The restaurant owner was forced to rely on the judgment of a busy cook as to when the food was done. In response to questioning on cross-examination on the ability of the cook to judge with reasonable accuracy when the food was done, Mr. Rulon testified:

> "That is exactly the point, sir. These machines will do it mechanically, automatically, whatever you call it, and before it was a compromise between a not-too-skilled man's judgment and the results that he was getting only looking at the outside of the food and not the inherent quality inside the food."

The defendant continued his questioning:

> "But if he stuck a fork into it and saw it was raw inside he would know that he started too hot, wouldn't he, and that he should have started a little lower?"

Mr. Rulon answered:

> "But it was too late, that food has been served." (App. 47.)

The Keating fryer for the first time provided a superior quality of product through automatic sequence of operation. It eliminated the old compromise between time and temperature and the dependence on the judgment or skill of the busy cook.

(3) *A remarkable advance in pre-heat time.*

The Keating device has a pre-heat time of 7.5 minutes (App. 32). The Kells patent (App. 169) claims a preheat time of 11 minutes in a 14″ x 14″ fryer (col. 5, line 71). Keating performs at approximately 140% of that claimed by Kells. Keating testified that in his test of the Wolf fryer (Pl. Ex. 8), the construction of which is similar to that shown in the Kells patent, he obtained a pre-heat time of 14 minutes and 10 seconds (App. 25). Here the Keating device performs at approximately 200% of Pl. Ex. 8.

(4) *Greater quantity of quality food produced per unit of time.*

Mr. Rulon's testimony that a battery of three Keating fryers holding 114 pounds of fat replaced a battery of four Pitman fryers holding 360 pounds of fat (App. 46) is impressive.

Mr. Fineran testified that the Keating fryer is capable of frying more food than a comparable sized fryer (App. 51).

The elimination of the recovery period by the Keating fryer did away with the requirement for waiting and thus secured a greater output of satisfactory food.

5. *Use of lower frying temperature.*

The Keating fryer has such a high rate of heat input that it uses a lower operating temperature (App. 34). In prior art fryers the standard thermostat setting was 375-400°F, whereas Keating requires 325-335°F. (App. 44-45). Since Keating is under the critical 337°F. limit, there is no fat deterioration due to heat (App. 31).

The restaurant owner secures a double benefit by using a lower operating temperature; he gets longer fat life and better tasting food (App. 31). An indication of the tremendous increase in fat life obtained by the use of

Keating's lower thermostat setting was given by Mr. Roulon. He testified (App. 45):

> "In, shall we say, the old days prior to the 1950-1951 days, in the Fryolater days, in the Pitman Fryolater days, if we got three days on the run of fat we were lucky. It was more between two and three days. Now we always exceed a week and we have got up to 10 and 11 days. In other words, the fat consumption is much less on the Keating than on the Fryolaters."

Since fat costs about 23¢ per pound (App. 32), with the quantities involved, the costs are quite substantial.

The appearance of the Keating fryer on the market brought immediate acceptance. The District Court found the evidence was quite clear that the Keating device was commercially successful (App. 11).

Hogate's Restaurants replaced operable Pitman fryers with Keating devices as soon as they came on the market in 1951 (App. 55). Hogate's uses approximately twenty-five fryers (App. 43). The replacement of so large an amount of usable prior art fryers is compelling evidence that the users of deep fat fryers found the Keating structure a great advance in the art.

Mr. Daniels testified that the Hot Shoppes chain, which at that time involved sixty restaurants each having two or three fryers, was replacing all their fryers with Keating devices as quickly as economically possible (App. 38, 41).

Mr. Keating testified (App. 60):

> "The Keating fryers are bought by especially busy restaurants, especially by chains such as the Hot Shoppes, Linton's in Philadelphia, the Slater Commissary System in Philadelphia, Toffenetti's Restaurants, the Union News in New York, John R. Thompson's, Foster Lunch Corporation in San Francisco, B & W Cafeterias, and the Keating Fryer only yester-

> day we received the first order from the Quartermaster Corps. The Keating fryer is now in general use in the busiest of restaurants all over the country."

Commercial acceptance of the Keating fryer was so great that "Commercial Current Events", published by Hot Point Electric Company, a competing maker of deep fat fryers, felt forced to write a deriding article on the Keating fryer (Pl. Ex. 1). Further support of the exceptional results obtained by Keating's device is shown in a paragraph of this article:

> "Compared to other gas fry kettles, it may be a world beater. The present A. G. A.—approved model has a recovery rate of 1.73 times that of the next best gas model tested by *the Hot Point engineers*" (Emphasis added).

Engineers of a competing maker of electrical fryers found that the results obtained from the Keating device were exceptional, and they certainly cannot be considered partial to any gas fryer.

The District Court clearly was in error when it held that the accomplishments of Keating did not merit a patent. The accomplishments of Keating's structure were sufficient to cause restaurant owners to replace operable fryers and cause a maker of competing electrical fryers to publicly belittle it.

The Court in *L-O-F Glass Fibers Co.* v. *Watson,* 97 App. D. C. 69, 76, 228 F. (2d) 40, 47 said:

> "We are bound first to look into the prior art to ascertain what may be the real merit of the invention and to decide whether or not it has substantially advanced the art. 'If it has done so, then the court is liberal in its construction of the patent, to secure to the inventor the reward he deserves.'"

The record shows how far the Keating device advanced the art. It makes the prior fryers obsolete. Restaurant owners find it to their advantage to replace operable fryers with Keating structures. The uncontradicted evidence conclusively shows that Keating made "a very useful discovery which substantially advanced the art".

B. This Court Has Wide Latitude of Review.

This court has a wide latitude of review in a patent case. This is based on the fact that the question of patentability "must be resolved by a subjective opinion as to what seems an easy step and what does not" *Kirsch Mfg. Co.* v. *Gould Mersereau Co.,* (2d Cir. 1925) 6 F. (2d) 793, 794, opinion by Judge Learned Hand.

> "Where the decision involved such a subjective opinion a somewhat wider latitude properly may be exercised by a reviewing court". *Standard Oil Development Co.* v. *Marzall,* 86 App. D. C. 210, 214, 181 F. (2d) 280, 284.

In the case at bar, there was substantial additional evidence before the District Court that was not before the Patent Office. In such a situation the decision of the Patent Office is not entitled to the weight ordinarily given it. *Standard Oil Development Co.* v. *Marzall, supra.* As will be shown, the inconsistent reasons given by the Patent Office in denying the granting of a patent compel the conclusion that they were confused as to the true inventive features of the Keating structure.

II. THE INCONSISTENT REASONS GIVEN BY THE PATENT OFFICE IN DENYING PATENTABILITY DEMONSTRATE A MISUNDERSTANDING OF INVENTIVE FEATURES CLAIMED BY THE KEATING STRUCTURE.

Throughout the prosecution of the Keating application, the Examiner, the Board of Appeals and the defendant's solicitor in the District Court have given completely inconsistent reasons for denying a patent to Keating. This strongly indicates there was a misunderstanding of the inventive features of the Keating structure over the prior art. Viewing the events from hindsight, the Patent Office in looking at what superficially appears to be merely a change of design, denied patentability for reasons that they changed as often as the applicant proved them wrong.

The Examiner's view was that Keating failed to show the criticality of the ratios claimed or that his difference in structure produced unexpectedly good results.

In his statement to the Board of Appeals, the Examiner said (App. 85):

> "In the instant case the specific proportions recited in the claims constitute only a minor variation, if any, from the construction of either Kells or O'Dowd and *it is not at all apparent why such variation should produce a great or unexpected result.*"

The Examiner continued (App. 86):

> "It is manifest therefore that in the absence of acceptable proof of successful operation with any open top cooking vessel having a plurality of oval, horizontal combustion tubes extending transversely therein, *the effect, criticality and value of the ratio's claimed is in doubt.*" (Emphasis supplied.)

The applicant then brought in affidavits substantiating his results (App. 91-94).

The Board of Appeals thereupon decided that the obtaining of the results was obvious, and that Keating's work was "merely the result of the routine tests necessary to determine the optimum relationship" (App. 100).

The Board of Appeals said (App. 99):

> "It seems that if economy of fuel is no desideratum and rapid heating is the principal objective, it would be obvious to any engineer that the more fuel that can be completely burned per hour the more heat will be generated. *In order to burn greater quantities of gas completely without a carbon monoxide residue, it*

> *is obvious that a larger space must be provided within which the increased quantities of fuel can be burned."* (Emphasis added.)

Of course the A.G.A. Laboratories Research Bulletins were not before the Patent Office to indicate the extent of prior efforts to accomplish what Keating had done.

It is gratifying to find that in the District Court, the Patent Office finally understood the underlying concepts of the problem even though not realizing there was a problem. Counsel cross-examined Keating as follows (App. 36):

> "Now isn't it perfectly obvious that the only way to get the temperature back to where it was originally is to put some heat into the fat?"
>
> * * * * *
>
> "And isn't it perfectly obvious that the quicker you bring in the heat the quicker the temperature will get back to where the thermostat was set?"

The cross-examination continued:

> "Now, isn't it true that in this patent to Kells he quite distinctly points out how desirable it is to have a higher rate of heat transfer into this fat?"

Mr. Keating replied to this last question:

> "Yes, he does" (App. 36).

This appeared to satisfy the Patent Office and Mr. Keating was dismissed (App. 36). When the Patent Office was finally on the threshold of seeing the problem involved, it stopped.

The appellant admits that it is "perfectly obvious that the quicker you bring in the heat the quicker the temperature will get back to where the thermostat was set." In fact, he carefully and painstakingly produced evidence in the District Court to show that this deficiency of heat was so obvious that the entire fryer industry was working to solve it; that the A.G.A. Laboratories selected it as a subject for two comprehensive research studies; that despite the universal knowledge of the need for securing a faster rate of heat, no one was able to find a solution. All the prior art attempted to solve it by increasing the heating surface. That the Patent Office finally realized "it was obvious that more heat was needed" is indeed gratifying, but there they stopped.

It was the defendant's contention that since heat had been used before in fryers, there was nothing new about Keating's structure. During the cross-examination of every witness, counsel for the Patent Office treated the problem as one of temperature alone. It viewed the thermostat as the solution to the whole problem (App. 34-36; 39-42; 46-48; and 54). The *rate* of heat is the crucial factor involved. The whole problem to be solved was how quickly could the thermostat be satisfied, not could it be satisfied. A small flame under the vessel could eventually heat the fat and satisfy the thermostat if we ignore the time problem, but a busy restaurant owner cannot. It is this question of time that is the critical factor—rate of heat transfer—that counsel for the Patent Office totally ignored.

Little reliance can be placed on the alleged expertness of the Patent Office when the evidence shows it was confused on the alleged inventive features of Keating's structure. So many contradictory reasons given for denying patentability, and all of them shown to be wrong, give little support to their being experts in the fryer area.

III. THE DISTRICT COURT WAS CLEARLY IN ERROR IN REFUSING TO COMPEL THE ISSUANCE OF A PATENT WHERE THE UNCONTRADICTED EVIDENCE SHOWS THAT APPELLANT'S STRUCTURE SATISFIED ALL THE APPLICABLE STANDARDS OF INVENTION.

The Keating fryer utilizes a combination of parts. It teaches a new and novel design of the heating tubes that gives an unexpected and useful result. "It is perfectly well settled that a new combination of elements, old in themselves, but which produce a new and useful result, entitles the inventor to the protection of a patent." *Expanded Metal Co.* v. *Bradford,* 214 U. S. 366, 381 (1909).

The uncontradicted evidence presented below showed there was a long-felt need for faster heat input in immersion tube heating of fryers. Many different methods were attempted and failed. The need became critical for the gas fryers when the electric fryers solved the problem. Due to size limitations and combustion difficulties there was not success despite intensive studies by the industry's top design engineers. Keating's structure solved the problem and enjoyed immediate and wide commercial success. Once his concept was disclosed, it now appeared simple.

> "It is plain from the evidence, and from the very fact that it was not sooner adopted and used, that it did not, for years, occur in this light to even the most skillful persons. It may have been under their very eyes, they may almost be said to have stumbled over it; but they certainly failed to see it, to estimate its value, and to bring it into notice * * * Now that it has succeeded, it may seem very plain to any one that he could have done it as well. This is often the case with inventions of the greatest merit. It may be laid down as a general rule, though perhaps not an invariable one, that if a new combination and arrangement of known elements produce a new and beneficial result, never attained before, it is evidence of invention." (*Loom Co.* v. *Higgins,* 105 U. S. 580, 591 (1881).)

The undisputed fact is that nowhere in the prior art of a competitive industry, not in patents, not in actual practice nor in publication has the Patent Office showed where Keating's concept—a specific relationship between combustion space and surface area—is taught or even suggested, despite being specifically asked to do so (App. 79). The Patent Office and the District Court ignored this.

The evidence shows the plain error of the District Court's finding that from the teachings of O'Dowd and Kells, the Keating structure was obvious to those skilled in the art and easily arrived at by routine experimentation. Elongated tubes were used by Pitman in 1927 (App. 143).

During the course of research in preparation of Research Bulletin No. 24, the A.G.A. Laboratories used twelve different types of round and elongated heat exchange tubes to determine their effect on increasing heat input (App. 127, 133-134). All of these shaped tubes were tested specifically to secure the greatest heat input to the fat. If it were just a matter of routine experimentation to proportion tubes disclosed by the Kells and O'Dowd patents to obtain Keating's structure, the problem most certainly would have been solved. In these studies the ordinary skilled man in the field was not performing the experimentation but design engineers desiring to secure the very result Keating obtained. These design engineers, had the active help of the gas appliance industry including the makers of the O'Dowd fryer (App. 121). Their design engineers carried O'Dowd's teachings to the logical conclusion, *i.e.,* the only way to get more heating surface was to use narrow elongated tubes (App. 134). Their exhaustive tests included routine experimentation, yet they were only able to obtain about 10,000 BTU per hour for each immersion tube (App. 133, Table 9). Keating's structure gets 26,000 BTU per hour for each immersion tube. It is very impressive evidence that what appears to be "obvious" from hindsight was actually a very difficult problem.

On the basis of such evidence for the District Court to make Finding of Fact 9 indicates he clearly misunderstood the inventive features of Keating's structure and the problems involved. Keating's structure was contrary to the prior art. He decreased the heat surface area (App. 65). The District Court in using hindsight to review the events overlooked or ignored the needs facing the users of deep fat fryers, the problems of the makers of gas deep fat fryers, and the history of over twenty-four years of vain attempts to supply adequate heat input to the fat.

> "But the fact remains that, in the face of a crying need for a new process or method in the industry, not one of the best engineers in the world, with their attention especially directed to the subject for approximately thirty years, was able to see what Kelley saw, or to produce the result which he produced." *Kelley* v. *Coe,* 69 App. D. C. 202, 209, 99 F. (2d) 435, 442.

The problem that was facing the deep fat fryer industry was not just a mere introduction of heat to the fat, but of introducing sufficient heat in a period of time to eliminate the recovery period. Throughout the trial the Patent Office strived to show that heat has always been introduced to deep fat fryers. Appellant does not deny that heat has been introduced ever since deep fat fryers have been used, but claims that Keating was the first to introduce a rate of heat sufficient to eliminate completely the recovery period from the sequence of operation of a deep fat fryer. The District Court appears to have misunderstood this distinction. The fact that Keating's device appears to be a simple change from the prior art does not disprove invention.

> "The difference between it and the prior art may not be great in a physical sense, but slight as it may seem to be it was sufficient to achieve success where success had never before been achieved. It was not merely one step in a developmental process, but was the one step from failure to success." *Kelley* v. *Coe,* 69 App. D. C. 202, 207, 99 F. (2d) 435, 440.

The District Court was misled by looking superficially at Keating's structure and the elongated immersion shaped tubes of O'Dowd and Kells. The change may appear to be a mere matter of degree or change of design, but this totally ignores all of the evidence presented on the difficult concepts involved and the very active research done in an attempt to accomplish what Keating has done.

Wach v. *Coe,* 64 App. D. C. 235, 77 F. (2d) 113, was a suit to compel the issuance of a patent on a device that permitted attaching a steam turbine to a shaft on a ship that was turned by a piston reciprocating steam engine. Here also both the Patent Office and the trial Court, viewing the events from hindsight, stated it was perfectly obvious from the prior art that any ordinary man skilled in the art could make Wach's device. They, too, totally ignored the evidence of consistent past failures and denied granting a patent. This Court in granting the patent said (64 App. D. C. 235, 236, 77 F. (2d) 113, 114):

> "It thus appears that the best marine engineers in the world, with unlimited means at their command, failed to solve the problem, the solution of which the tribunals of the Patent Office and the Court below have ruled to be obvious to any one skilled in the art.
>
> "While appellant's solution of the problem was as simple as it was efficient, it by no means follows that it did not involve invention.

This Court continued (64 App. D. C. 235, 237, 77 F. 2d 113, 115):

> "The apparent simplicity of the new device often leads to the assertion by inexperienced persons that anyone familiar with the subject could have produced it, 'but the decisive answer is that, with dozens and perhaps hundreds of others laboring in the same field, it had never occurred to any one before.'
>
> * * * * *
>
> "What has been ruled to be obvious was not obvious to the highly skilled marine engineers who at-

> tempted to solve the problem. Appellant succeeded where they failed, and his success in the circumstances should be recognized by the granting of a patent."

Impartial and experienced users of fryers testified to the impressive and beneficial results obtained from the Keating fryer. They were unanimous in testifying to the great advance made over the art by Keating. While the District Court found the Keating structure an improvement over the prior art, it ignored the evidence that satisfied the Supreme Court's standard of invention and lifted it from an improvement to a patentable invention, *Loom Co.* v. *Higgins,* 1881, 105 U. S. 560, 591 and *Expanded Metal Co.* v. *Bradford,* 214 U. S. 366, 381 (1909).

This Court recently in *L-O-F Glass Fibers Co.* v. *Watson,* 97 App. D. C. 69, 228 F. (2d) 40, reversed the Patent Office and the District Court which held that the applicant's disclosure was not invention over the prior art. This Court's decision in that case is particularly applicable to the facts at bar.

When this Court sees the problems of the gas fryer industry, the vain attempts by others to solve this problem, the novel approach by Keating, the unexpected but beneficial results obtained by his structure, the great advance it made in the art and its immediate commercial success, it should be evident that a mistake has been made by the District Court. Keating's advance clearly merits a patent.

Second Application, Serial No. 197,036.

STATEMENT OF CASE.

This application (Pl. Ex. 2, App. 105) relates to a fryer of the same general type as discussed in connection with the preceding application with the particular structure involved being the drain construction.

It is necessary periodically to remove the crumbs and debris which collect on the bottom of the cooking vessel during the course of the fryer operation (App. 56). The fat being in constant use retains particles of crumbs in suspension which are too small to settle out. To strain out these particles requires removal of the fat (App. 53). The more frequent the straining is done, the better will be the quality of the fat used in the frying operation (hence better quality food) (App. 58). The amount of straining of the fat was limited in prior art fryers only by reason of the amount of time it required (App. 58).

Drains were generally used to aid in removal of fat in prior art fryers. The uncontested evidence shows there was considerable problem of stoppage in prior drains (App. 53). These drains were simply vertical pipes extending downwardly from the bottom of the cooking vessel. The bottom of the vessel had panels pitched toward the center where the drain entry was located. Slivers of potatoes falling from the basket of potatoes being cooked became very hard when they remained in the fat any length of time. These relatively long particles intermingled with the other food particles and blocked the drain. To break this "log jam," the operator poked a rod up the drain to allow the fat to flow again (App. 53). Great care must be used by the operator to prevent being splattered as the fat flowed since its temperature was over 350° F. (App.

> tempted to solve the problem. Appellant succeeded where they failed, and his success in the circumstances should be recognized by the granting of a patent."

Impartial and experienced users of fryers testified to the impressive and beneficial results obtained from the Keating fryer. They were unanimous in testifying to the great advance made over the art by Keating. While the District Court found the Keating structure an improvement over the prior art, it ignored the evidence that satisfied the Supreme Court's standard of invention and lifted it from an improvement to a patentable invention, *Loom Co.* v. *Higgins,* 1881, 105 U. S. 560, 591 and *Expanded Metal Co.* v. *Bradford,* 214 U. S. 366, 381 (1909).

This Court recently in *L-O-F Glass Fibers Co.* v. *Watson,* 97 App. D. C. 69, 228 F. (2d) 40, reversed the Patent Office and the District Court which held that the applicant's disclosure was not invention over the prior art. This Court's decision in that case is particularly applicable to the facts at bar.

When this Court sees the problems of the gas fryer industry, the vain attempts by others to solve this problem, the novel approach by Keating, the unexpected but beneficial results obtained by his structure, the great advance it made in the art and its immediate commercial success, it should be evident that a mistake has been made by the District Court. Keating's advance clearly merits a patent.

Second Application, Serial No. 197,036.

STATEMENT OF CASE.

This application (Pl. Ex. 2, App. 105) relates to a fryer of the same general type as discussed in connection with the preceding application with the particular structure involved being the drain construction.

It is necessary periodically to remove the crumbs and debris which collect on the bottom of the cooking vessel during the course of the fryer operation (App. 56). The fat being in constant use retains particles of crumbs in suspension which are too small to settle out. To strain out these particles requires removal of the fat (App. 53). The more frequent the straining is done, the better will be the quality of the fat used in the frying operation (hence better quality food) (App. 58). The amount of straining of the fat was limited in prior art fryers only by reason of the amount of time it required (App. 58).

Drains were generally used to aid in removal of fat in prior art fryers. The uncontested evidence shows there was considerable problem of stoppage in prior drains (App. 53). These drains were simply vertical pipes extending downwardly from the bottom of the cooking vessel. The bottom of the vessel had panels pitched toward the center where the drain entry was located. Slivers of potatoes falling from the basket of potatoes being cooked became very hard when they remained in the fat any length of time. These relatively long particles intermingled with the other food particles and blocked the drain. To break this "log jam," the operator poked a rod up the drain to allow the fat to flow again (App. 53). Great care must be used by the operator to prevent being splattered as the fat flowed since its temperature was over 350° F. (App.

53). After the container was filled, it had to be dragged out from under the vessel, with the fat still to be strained. The straining process consisted either of pouring this hot fat from this container through a cheesecloth into another container, or else a special filtering device had to be purchased to filter the fat as it was poured into the fryer vessel (App. 59).

The Keating structure provided a back panel in the bottom of the cooking vessel and a drain pipe located so as to provide a continuous chute down the back panel and through the drain pipe (App. 105). This reduces clogging. The food particles are forced into alignment so that they tend to be lengthwise rather than crosswise when they reach the drain (App. 58).

With this construction Keating was able to use a drain pipe only one inch in inside diameter, whereas the drains on the prior types were 1¼ inch inside diameter (App. 58).

Keating's drain is also so positioned that a straining bag can be placed directly on the end of the drain. Keating was the first to provide straining directly at the drain (App. 59). The Keating drain enables the operator as a practical matter to strain the fat after each meal or service period, which is of a tremendous advantage in maintaining clean and pure fat which makes for higher quality food.

This application contains six claims, which are set out at App. 109-111.

The Commissioner of Patients rejected the application on Swindell patent No. 366,701, Pappas patent No. 2,528,776 and Kells patent No. 2,429,360 on the ground that the Keating structure falls within the skill of the art and does not amount to invention (App. 114-117).

The Kells patent in Figure 1 shows only half of the cooking vessel and tubes of his 14″ x 14″ fryer. The drain 37 extends vertically from a point about the center of the vessel bottom (App. 169).

The Pappas drain is likewise a vertical drain located centrally of the cooking vessel bottom (App. 183).

Swindell shows a drip pan with an inclined bottom and spout from which the drippings of the cooking article pour into a receptacle (App. 177).

The trial Court found "the evidence was quite clear that plaintiff's device was an improvement over prior fryers and that it attained commercial success" but rejected a patent on the ground it was obvious to an ordinary man skilled in the art (App. 11).

Since the Keating structure has been on the market, four competing makers have adopted his drain construction (App. 60).

ARGUMENT.

The prior art on which the Patent Office rejected the Keating application clearly does not show the Keating structure. Kells and Pappas are subject to the clogging and all the other objections mentioned above. Straining directly on the drain is impossible with these structures. Swindell does not even show a deep fat fryer, and no problem of straining was involved in the Swindell disclosure.

Both Fineran and Keating testified that prior to 1950 they were not aware of any deep fat fryers with the Keating drain construction. Both testified as to the superiority of the Keating construction (App., Fineran, 53; Keating, 57-58).

The drain structure has been paid the tribute of imitation by four competing manufacturers.

> "The fact that all the elements entering into a combination are old does not necessarily negative the existence of invention. * * * Such a combination may be patentable invention if it produces a new result or

> an old result in a new or more efficient way. * * *"
> *Electronics, Inc.* v. *Coe,* 1938, 69 App. D. C. 181, 189, 99 F. (2d) 414, 422."

In viewing the events from hindsight, the Patent Office and the trial Court fell into the easy error of assuming something was obvious to the ordinary man skilled in the art, when the evidence presented showed that it was not adopted even though the inconvenience and danger existed for many years. It was only when Keating's structure came on the market that the manufacturers changed. The District Court says that Keating's structure was obvious but the uncontradicted evidence shows otherwise.

The questions asked Mr. Keating on cross-examination in this second case (App. 60-61), as in the first case, exhibited the same avoidance of the real nature of the subject matter.

The District Court found Keating's structure was clearly an improvement over the prior art and only rejected granting a patent because of a mistaken assumption, in viewing the events from hindsight, that it was obvious. The evidence clearly showed the District Court was in error and the appellate court should reverse to rectify this mistake.

CONCLUSION.

It is submitted that the judgment of the District Court should be reversed, with directions to enter a judgment granting the relief sought in the complaints.

Respectfully,

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Of Counsel:
William L. Mathis.

SUPPLEMENT TO BRIEF.

STATUTES INVOLVED.

U. S. C. Title 35

Section 101. *Inventions patentable.*

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Section 102. *Conditions for patentability; novelty and loss of right to patent.*

A person shall be entitled to a patent unless—

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or

(c) he has abandoned the invention, or

(d) the invention was first patented or caused to be patented by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application filed more than twelve months before the filing of the application in the United States, or

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or

(f) he did not himself invent the subject matter sought to be patented, or

(g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

SECTION 103. *Conditions for patentability; non-obvious subject matter.*

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

BRIEF FOR APPELLEE

IN THE

United States Court of Appeals
For the District of Columbia Circuit

United States Court of Appeals
For the
District of Columbia Circuit

FILED MAR 4 1957

Joseph W. Stewart
CLERK

Appeals Nos. 13612-13613

Richard T. Keating, *Appellant*

v.

Robert C. Watson, Commissioner of Patents,
Appellee

Appeal from the Judgment of the United States District Court
for the District of Columbia

Clarence W. Moore,
Solicitor, United States
Patent Office,
Attorney for Appellee

J. Schimmel,
Of Counsel.

Appeals Nos. 13612-13613

STATEMENT OF QUESTIONS PRESENTED

In the opinion of appellee the questions presented by these appeals are:

1. In Appeal No. 13,612; Is appellant's deep fat fryer patentable where the only difference between the subject matter sought to be patented and the prior art is the proportioning and dimensional relationship of the combustion tubes with relation to the cooking area and where the prior art recognized the importance of rapid heating and of the effect that shape and dimension of the combustion tubes had on the speed of temperature increase, and where the selection of proper proportions to get rapid heating would be within the skill of the ordinary worker in the art.

2. In Appeal No. 13,613:—Is appellant's combination in a single structure of various features old in prior patents inventive and patentable, where there is no new cooperation or result, each element operating in the combination in the same way as in the old structure unaffected and uninfluenced by the proximity of the other elements?

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IN THE

United States Court of Appeals For the District of Columbia Circuit

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Appeals Nos. 13612-13613

RICHARD T. KEATING, *Appellant*

v.

ROBERT C. WATSON, COMMISSIONER OF PATENTS,
Appellee

Appeal from the Judgment of the United States District Court for the District of Columbia

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BRIEF FOR THE COMMISSIONER OF PATENTS

INTRODUCTION

This is an appeal from the judgment of the United States District Court for the District of Columbia dated August 24, 1956, (App. 14), dismissing appellant's complaints in two suits against the appellee, Commissioner of Patents, (App. 1 and 6), brought under the provisions of Section 145 of Title 35 United States Code, in which appellant sought decrees authorizing the Commissioner to grant two patents based upon and containing certain claims of the Keating patent applications Serial Nos. 197,035 and 197,036, each filed on November 22, 1950, and each entitled "Deep Fryer." The two suits were consolidated for trial by order of the Court dated April 6, 1956. (App. 9).

The complaints were dismissed by the trial Court, because none of the claims in suit define anything inventive over the prior art (Findings of Fact Nos. 12 and 13—App. 14), and therefore the plaintiff (appellant was not entitled to a patent (Conclusions of Law Nos. 2 and 3—App. 14). Notice of appeal was filed on October 10, 1956 (App. 15).

APPELLANT'S APPLICATION

The subject matter of the two Keating applications is a commercial deep fat fryer of the gas or oil heated type, as used generally in restaurants and hotels (App. 67). Such a fryer is usually comprised of a supporting cabinet, gas burners, a cooking or frying vessel, a drain and spout for draining off contaminated cooking fats from the vessel, and a door at the front of the cabinet providing access to the drain spout. (App. 9, 10).

The first Keating application, Serial No. 197,035, is directed to the structure and design of the elements of the gas burner, particularly of the tubes in which combustion takes place. A plurality of combustion tubes extend transversely through the vessel above the bottom thereof, so that the upper portion of the cooking fat therein may be maintained at a temperature high enough for quick frying of foods immersed therein, while the fat in the vessel below the tubes is maintained at a lower temperature (App. 67). The tubes are of oval cross section, mounted side by side and in upright position (App. 72), and they are so dimensionally related to the cooking vessel that the fryer is alleged to be capable of heating much more rapidly than are other conventional types (App. 68). Ideal results are said to occur when there is about 2.8 cubic inches of combustion space per square inch of area of cooking vessel, with very satisfactory results ratios of 2.5:1 to 3:1 (App. 71). In addition it is taught that the surface area of the combustion tubes available for radiation and heat transfer should be held in fairly definite proportion to the volumetric capacity of the combustion tubes, that is, that there should be about one square inch of tube surface for every cubic inch of combustion space (App. 72).

The second Keating application, Serial No. 197,036, describes a deep fryer of the gas heated type in which the cooking vessel is mounted on and supported by an open front housing, with the cooking vessel spaced away from the front of the housing to provide a burner compartment therebetween, and with the front of the housing closed by a door. (App. 106). The bottom of the cooking vessel is formed of panels inclined downwardly from the rear and sides, so that the lowermost point is at the center of the forward edge (App. 106). A drain valve and spout are angularly affixed to the vessel at this point, and extend forwardly beyond the front edge of the housing, below the burners and within the closure (App. 107). The construction is such that the burners, manifolds, control valve and correlated parts of the heating system the drain valve and its spout are positioned at the front of the fryer housing and well above the base thereof, with the base recessed to permit a pail to be placed on the floor and partially within the housing as the cooking fat is drained from the vessel. (App. 106).

THE CLAIMS

There are eight claims at issue in the first application, Serial No. 197,035. These claims are found in the joint appendix at pages 73 to 75 incl. Of these claims, claim 1 is said by appellant to be typical (Br-12). No contention was made below and none is made here that any one of the other claims contains any limitation which would make it patentable over claim 1, in the event that this Court should find that there was no error in the holding of the trial Court that claim 1 is unpatentable. Under these circumstances it is believed to be clear that the claims stand or fall together.

There are six claims at issue in the second application, Serial No. 197,036. Appellant's brief does not discuss the claims. The decision of the Board of Appeals refers to claim 1 and states that it is the most specific of the claims at issue (App. 114). The trial Court did not consider the individual claims, but considered the claims as a group, holding that none of them defines anything inventive over the prior art. Under these circumstances also it is believed to be apparent that the claims stand or fall together.

THE PRIOR ART

The patent to Kells, 2,429,360 (App. 169-175) describes a deep fat fryer of the gas heated type having combustion tubes extending transversely through the cooking vessel, intermediate the bottom and top. The tubes may be oval in cross-section with the height greater than the width. The patentee points out the construction provides a high rate of heat generation in the limited combustion space available. A drain is also provided. (Finding of Fact No. 4—App. 12).

The patent to O'Dowd, 2,182,735 (App. 152-167) relates to a deep fat fryer of the gas fired variety, in which an open top cooking vessel has a plurality of horizontal combustion tubes, oval in cross section, extending transversely therethrough. (Finding of Fact No. 5—App.13).

The patent to Pappas, 2,528,776 (App. 183-188) describes a deep fat fryer, in which the frying container has sloping bottom walls at the lowest point of which is a drain conduit and valve. A space is provided at the bottom of the housing for the pan used in draining the container. The cabinet enclosing the fryer has a door. (Finding of Fact No. 6—App. 13).

The patent to Swindell, 366,701 (App. 177-182) relates to a gas stove with a drip pan sloping toward the front of the stove where there is a spout to drain into a receptacle placed therebelow. (Finding of Fact No. 7—App. 13).

The publication of the American Gas Association Testing Laboratories (App. 119-135) teaches that heating speed and heat transfer characteristics of commercial deep fat fryers may be improved by selection of the proper size and cross-sectional shapes of the combustion tubes, by increase in vertical stack height, by the use of power burners instead of atmospheric type burner equipment, and by increasing the heat transfer areas materially with atmospheric burners and without objectionable vertical stack heights (App. 123). Increase in heating speed of 60% by the use of stack height up to 6 feet and a baffling is indicated (App. 124), and heating speed was said to be doubled by use of an open type pressure burner (App. 124).

SUMMARY OF ARGUMENT

Appeal No. 13,612

1. Deep fat fryers having the structure defined in illustrative claim 1 of the involved application are old in the prior art, even to the use of oval shaped combustion tubes with the long axis extending in the vertical direction. Patentability is predicated completely on the proportioning of the number and size of the tubes to provide a volumetric capacity of from 2½ to 3 cubic inches per square inch of area of the cooking vessel, in order to provide for a rapid heating of the cooking fat. The importance of the dimensional relationships in combustion tubes is recognized by the patentee Kells, along with other factors, in attaining faster heating and increased "recovery speed." The determination of the exact dimensions of the tube in relation to their external surface and the cooking area is no more than the application of judicious mechanical skill, not invention.

2. The alleged new concept employed by appellant of decreasing the tube surface area instead of increasing such area is not supportable in the record. The specification does not state that appellant's invention involved reduction in surface area of the combusion tubes. The fortuitous circumstance that the fryer described in Example V of the specification showed faster heating time than that described in Example IV even though the tube surface area of the latter was greater does not support appellant's contention. While the specification recognizes the importance of

increase in volumetric capacity of the tubes in increasing the heating rate, a fact which is obvious, the specification also recognizes that there must be sufficient surface area for effective radiation of the heat of combustion. Moreover, Examples I, II and III of the specification clearly show increased heating speed with increase in both volumetric capacity of the tubes and surface area thereof. Routine experimentation with facts available and known to the skilled worker is all that is necessary to achieve a faster heating time.

3. The reliance placed by appellant upon the use of lower cooking temperatures as indicative of invention is misplaced. The specification does not mention that alleged advantage; the only temperature mentioned is that commonly used in the art, namely 375° F. This undisclosed advantage cannot be the basis for patentability.

4. Commercial success as an indicia of invention is only a reliable one if the question of invention is in doubt. Here commercial success seems to be based upon undisclosed factors, namely, the thermostatic setting at 325°-335° F. Under these circumstances the make weight of commercial success is inoperative. The evidence is insufficient on the question of invention; therefore commercial success carries no weight in law.

SUMMARY OF ARGUMENT

Appeal No. 13,613

1. The subject matter of illustrative claim 1 of the involved application aggregates features old in three prior patents, producing only the aggregate of the individual results. No novelty of cooperation is

achieved; no new result emerges from the association of these old features from the prior art. While appellant may be the first to combine in a single structure the best features of the prior art structures, and while the combination is useful and commercially successful, invention is lacking, and without invention there is no justification for a patent monopoly.

THE ARGUMENT—APPEAL NO. 13,612

Since all the claims sought in the first application, Serial No. 197,035, were refused by the Patent Office on the same references, namely Kells in view of O'Dowd (App. 97) and the trial Court concurred in the conclusions of the Patent Office (App. 11), all the claims may be considered as a unit. Claim 1 is deemed by appellant to be typical (Br-12). Under these circumstances, the issue as to all the claims may be determined by a detailed consideration of that claim.

From even a casual reading of claim 1 (App. 73) it is evident that a deep fat fryer is defined comprising an open top cooking vessel having a plurality of horizontal combustion tubes extending transversely through the interior thereof, but spaced above the bottom and below the top, the tubes being of oval configuration with their height greater than their width. Deep fryers of that construction are shown to be old in the patents to Kells and O'Dowd. In the former, oval shaped tubes are shown in Figure 9 (App. 169), and are described as being arranged to extend transversely across the cooking vessel, with the long axis in the vertical dimension (App. 172, col. 3, line 74). In the latter also, the heating flues extend transversely across the interior of the cooking vessel, and are of vertically elongated shape (App. 166, col. 1, lines 20-

25). In each, the tubes are intermediate the top and bottom of the cooking vessel. Since the defined structural arrangement is old, patentability is clearly being predicated upon the proportioning of the combustion tubes set out in the expression "and having internal combustion space with a volumetric capacity of substantially 2.8 cubic inches per square inch of area of the cooking vessel, yet having substantially one square inch of surface area per cubic inch of combustion space."

This limitation was characterized by the examiner as nothing more than a mere determination of proper size and proportioning of well known structures, falling in the category of routine machine design (App. 81). This opinion was based upon the fact that Kells also was interested in achieving a low heating load per unit area (App. 171, col. 1, line 33), a faster "recovery speed" (col. 5, lines 62-72), and better efficiencies. In accomplishing these results Kells recognized the importance of dimensional relationships in tubes for efficient heat transference (App. 171, col. 2, lines 4-10), in addition to other factors, such as heat input, fryer dimensions (App. 173, col. 5, lines 49-53), tube heating surface, and the effect of the wiping action of the tube surfaces by the liquid to favor rapid heat transference (App. 171, col. 1, line 40). Of particular significance is the fact that the patentee states that the speed of temperature increase resides in part in the shape and dimension of the heat exchange tubes and in part in the character and loading of the burner. (App. 173, col. 6, lines 6-10). The Board of Appeals agreed with the examiner that appellant had exercised nothing more than judicious mechanical design in proportioning the tubes of the prior art references in the specific manner claimed (App. 99), even though appellant's fryer was admitted to be an improvement (App. 100). Further, the Board stated that no unobvious principle of thermodynamics was involved (App. 99), and that in designing a deep fat fryer that is to have a fast recovery rate, there are several variables involved, and the claimed proportions are merely the result of routine tests necessary to determine the optimum relationship. (App. 100). And the District Court after a full consideration of the evidence concluded that, though appellant's device was an improvement over prior fryers, had obtained commercial success, was more convenient and more economical in use, the improvement fell into that class where, though beneficial, it does not show sufficient originality or novelty to merit a patent monopoly (App. 11).

Appellant contends (Br-15) that the District Court erred in holding that the improvement was only a change in degree over the prior art, which would be apparent to anyone of ordinary skill. Appellant urges that he went contrary to the prior art (1) in decreasing the tube surface (Br-16) and (2) in introducing the heat more quickly, because of his concept of proportioning the combustion space within the tubes and the surface area of the tubes (Br-21). In considering this contention as to item (2) it is important to note that in the Patent Office affidavits were filed by appellant and others comparing the heating rate of appellant's fryer and certain commercial fryers, but no comparison was made with the Kells and O'Dowd devices, as pointed out by the Board of Appeals (App. 97). Also it should be noted that the testimony at the trial (App. 24, 25) was that a structure "similar to the drawings shown in the Kells patent" was tested. These affidavits and tests are deficient, under the doctrine of Blanchard v. Ooms, 80 U.S. App. D.C. 400, 153 F. (2d) 651, on the issue of whether appellant's device is inventive by reason of improvement over the prior art. The same criticism applies to the testimony of the appellant's experts, said by appellant to be "the three most outstanding men in their respective fields in the city of Washington" (Br-17), since these experts made no comparison with the devices disclosed in the patents relied upon. Further, it appears that in testing the device "similar" to Kells appellant testified that he obtained a preheat time of 14 minutes and 10 seconds (App. 25), while the patentee expressly states that "the present 14″ x 14″ fryer raises its cooking liquid of the same cooking depth to 390° in 11.0 minutes" (App. 173, col. 5, lines 69-72). No explanation appears to account for this discrepancy. Certainly under the Blanchard case the evidence relied upon by appellant does not support this contention. Note also that appellant compares his cooking temperature of 375° F. with Kells' temperature of 390° F. (App. 92).

Appellant also contends (Br-27) that the Research Bulletin of the American Gas Association Testing Laboratories (App. 119-135) shows that the problem of increasing heat input in deep fat fryers was a serious one to the industry, and that the only conclusion reached after a study of the problem was to increase the heating surface (Br-27). This view of the findings in that report ignores completely that it is expressly stated therein that forced circulation of cooking oil would permit attainment of considerably higher heating speeds with heating surface areas of the same order as those now employed on contemporary fryers (App. 124); that an increase in heating speed of 60% can be obtained by increasing stack height up to 6 feet and baffling (App. 124); that an open type pressure burner doubled heating speed (App. 124); that the most obvious method of increasing heating speed would be to increase the gas input rate (App. 128); and that a heating speed almost double that obtained with the original rate could be reached with increased input ratings (App. 129).

Given Kells' teaching of 11.0 minutes to reach 390° F. from room temperature with an input of 48,000 B.t.u. per hour (App. 173, col. 5, lines 69-72), and the findings enumerated by the Research report on ways to increase heating speed, it is submitted that one skilled in the art would have little difficulty increasing the heating rate of a deep fat fryer of the type disclosed by Kells or O'Dowd. Since the introduction of heat quickly is said to be the crux of the case (Br-21), it has not been shown that appellant by his construction has produced unusual or superior results over the prior art, particularly when such art is considered in the light of facts known to those skilled in the art. As pointed out in the Blanchard case, supra, both law and reason require appellant to make such a showing, if the improvement is to rise to the dignity of invention. Lacking such a showing, and it is submitted that the evidence offered below is completely inadequate in this respect, it would appear that the trial Court's finding that the improvement made lacks sufficient originality or novelty to merit a patent monopoly (App. 11) has ample support in the record.

As pointed out below (App. 11) the authorities are abundant that not all improvement is invention and entitled to protection as such. This Court has repeatedly held that the use of mere skill to produce a desired improvement does not constitute invention, even though there may have been extensive experimentation. Minnesota Mining & Mfg. Co. v. Coe, 69 App. D.C. 217, 99 F. (2d) 986; Sonneborn Sons, Inc. v. Coe, 70 App. D.C. 97, 104 F. (2d) 230; Ethyl Gasoline Corp. v. Coe, 79 U.S. App. D.C. 301, 147 F. (2d) 27; Rembert et al. v. Coe, 78 U.S. App. D.C. 51, 136 F. (2d) 793; Sherwin Williams Co. et al. v. Marzall, 88 U.S. App. D.C. 374, 190 F. (2d) 290; Dalin v. Watson, 92 U.S. App. D.C. 270, 204 F. (2d) 730. The facts of the instant case show that the claimed improvement falls clearly within the established rule.

With respect to appellant's contention that he went contrary to the prior art thinking by decreasing tube surface (Br-16) it should be noted that there is no clear and definite statement in the application at bar that such a concept was contemplated by the applicant. In fact a reading of the description (App. 71) gives the distinct impression that appellant came to the conclusion that volumetric capacity of the combustion tubes and surface area jointly contribute to rapid heating. Such a conclusion would be obvious to reach from a study of the examples given in the specification (App. 68-70). The figures given for the volume and surface area of the combustion tubes of Examples I to III show a gradual increase in both, and a corresponding decrease in the time to bring the temperature of the fat to 375° F. Also if one compares Example III with Example V where the surface areas are substantially the same, the conclusion to be arrived at is clearly that with such large surface area, further decrease in time of heating will result if the volumetric capacity be increased. However, as pointed out by the Board of Appeals (App. 99) it would be obvious that burning more fuel in the same time interval will produce more heat, and a larger space should be provided to do that job. Also as pointed out in the Gas Association Bulletin (App. 128) the most obvious method of increasing heating speed is to increase the gas input rate. A comparison of Examples III and V merely confirms these obvious facts. Therefore, it is apparent that all appellant did by increasing the volumetric capacity of the old fryer of Example III was the obvious thing, utilizing known facts to accomplish the predictable result. Instead of operating contrary to prior thinking as alleged, appellant adopted the prior knowledge and skillfully applied it to the problem at hand. The improvement accomplished, namely a further reduction in the time needed to bring the fryer to heat, is nothing more than a step forward in the gradual process of development of a better fryer, one which differs in degree only from the prior art. This is not invention. Sinclair v. Interchemical, 325 U.S. 327; Marconi v. U. S., 320 U.S. 1; In re Dalzall, 33 CCPA 808, 152 F. (2d) 1013.

Appellant also makes much of the fact that in his device the standard thermostat setting is 325° F. to 335° F., which is below the critical temperature of 337° F. (Br.-5), and contends that this added distinction and advantage over the prior art fryers which operated at 375° F. to 400° F. (Br-13) spells invention. The testimony at the trial was to the same effect (App. 31, 38, 45, 52), and a great deal of the commercial success of appellant's fryer appears to be due to the use of such lower frying temperature. However, it is significant that the specification in which appellant is required by law (35 U.S.C. 112) to set forth in full, clear, concise and exact terms a written description of his invention contains no disclosure of a thermostat and no indication that a frying temperature of 325°-335° F. was part of his invention. In fact in Example V (App. 71), which gives the data respecting appellant's fryer a temperature of 375° F. is specified. Either appellant's specification fails to meet the express mandate of the statute, or appellant's alleged advantage over the prior art must be disregarded in determining whether an invention has been made. Abbott v. Coe, 71 App. D.C. 195, 109 F. (2d) 449. More over, if the appellant's device attained commercial success because of the lower operating temperature as well as the more rapid heating, that fact is of no significance since it has no bearing on the question of invention. Tropic Aire v. Sears Roebuck & Co., 282 U.S. 904; Union Metal v. Ooms, 81 U.S. App. D.C. 76, 154 F. (2d) 857.

Appellant contends also that this Court has wide discretion of review, and should reverse the trial court where its findings are clearly inconsistent with the evidence (Br. 20). Appellee has no quarrel with this general principle. However, it is submitted that in the instant case the finding of no invention by the trial court is consistent with the evidence, for the reasons detailed above. On principle then this Court should affirm. Abbott v. Coe, 71 App. D.C. 195, 109 F. 2d 449; Esso Standard v. Sun Oil Co., 97 U.S. App. D.C. 154, 229 F. 2d 37.

THE ARGUMENT—APPEAL NO. 13,613

All the claims in the second application Serial No. 197,036, were refused on a combination of three references, Pappas, Kells, and Swindell (App. 115), and the trial court concurred (App. 11). The Board of Appeals considered claim 1 as illustrative (App. 114). Appellant's brief does not discuss the claims. Under the circumstances the issue as to all claims may be determined by a consideration of that claim.

The deep fat fryer defined in claim 1 is of the same general type as that illustrated and described in the patent to Pappas No. 2,528,776 (App. 183-188), comprising a supporting cabinet, gas burners, a frying vessel, a drain and a spout for draining off fat from the vessel, and a door at the front of the cabinet providing access to the drain spout. Admittedly appellant's fryer differs from that of Pappas as to certain details (App. 115); however, it was held that the differences over Pappas are either suggested by the other prior art patents or else are mere mechanical variations within the skill of the ordinary worker in the art.

Since appellant merely contents himself with stating that the prior art relied on does not show his structure and seems to rely primarily on the difference in drain structure (Br. 49) it is believed that the Court should be made aware of the fact that the burner arrangement of Pappas does not conform precisely to that recited in the claim, as acknowledged by the Board of Appeals (App. 116). However, the burner arrangement shown in Kells is essentially the same and the substitution thereof for that shown in Pappas would clearly fall within ordinary mechanical skill. Insofar as the location of the drain at the front of the cabinet is concerned, and the forward inclination of the spout therefrom, it is believed to be obvious that if difficulty were to be encountered in emptying the vessel of Pappas because of the location of the drain and drain spout, any good mechanic would relocate these components where they would be readily accessible to the operator, particularly if he had before him the Kells disclosure where the structure association and disposition of similar parts are shown disposed assymmetrically in proximity to an outer wall of the cabinet. Also given Swindell's location of a drain spout and a recess for a receiving pail at the front of the cooking apparatus, the redesigning of Pappas' fryer would not involve inventive ingenuity. In the aggregate, it is submitted that all that appellant has done is to take the old and well known fryer of Pappas' and supplied it with a plurality of optional variations of obvious nature and character, selected from the prior art, the association of which in a unitary structure produces only the aggregate of the individual results. Even assuming that the combination was useful and that its commercial success was due to the elements grouped and associated as in claim 1, invention is not necessarily present. There is no novelty of cooperation between the elements thus associated A & P v. Supermarket Equipment Corp., 340 U.S. 147; Magnaflux Corp. v. Coe, 78 U.S. App. D.C. 258, 139 F. 2d 531.

It is submitted that the trial court's finding that the appellant's accomplishment did not rise to the dignity of invention (App. 11) is not erroneous, and that it merits this Court's approval.

CONCLUSION

It is respectfully submitted that for the reasons detailed herein, none of the claims in Appeal No. 13,612 or Appeal No. 13,613 defines patentable subject matter over the prior art; that the conclusions reached by the Patent Office tribunals and the trial court were correct; that they have a rational basis in the record; and that the decision appealed from should be affirmed.

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March , 1957

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PLAINTIFF-APPELLANT'S REPLY BRIEF.

IN THE

United States Court of Appeals for the District of Columbia

United States Court of Appeals
For the
District of Columbia Circuit

FILED MAR 26 1957

Joseph W. Stewart
CLERK

Nos. 13612 - 13613

RICHARD T. KEATING,
Appellant,

vs.

ROBERT C. WATSON, COMMISSIONER OF PATENTS,
Appellee.

APPEAL FROM A JUDGMENT IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF COLUMBIA.

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United States Court of Appeals for the District of Columbia

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RICHARD T. KEATING,
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Appellee.

APPEAL FROM A JUDGMENT IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF COLUMBIA.

PLAINTIFF-APPELLANT'S REPLY BRIEF.

Appellee's brief ignores most of the record and is based on erroneous assertions of fact.

Appeal No. 13,612.

1. Appellee's whole brief is based on a refusal to recognize the difference between transfer of heat from the outside surface of the tube to the fat (which was the effort of the prior art, principally Kells and the A.G.A. engineers) and the transfer of heat from the flame to the fat (which gave the improved heat transfer attained by appellant). Kells and the A.G.A. engineers taught increased tube surface to get more fat in contact with the tubes. In the limited confines of a fryer, this can

only be accomplished by using many narrow tubes (App. 134, 171). Keating went contrary to this prior art thinking by providing a definite ratio between the combustion space and the tube surface area with marked and unexpected results in the transfer of heat from the flame to the fat. The appellee and the District Court treat these two distinct and different types of heat transfer as one, although entirely different concepts are involved in each and the difference in results is the difference between success and failure (Appellant's Main Br. 11).

It was not until May, 1952, after the Keating fryer was on the market (App. 38), that the A.G.A. engineers stated (App. 138):

> "*The major obstacle to improved gas fryer performance was found to be the difficulty of transferring sufficient heat from gases to the small kettle surface area. Extended surfaces or fins* on the *gas side* of fry kettle walls were found to provide a satisfactory method of obtaining augmented area. The *fat side* resistance to heat flow was found to be relatively unimportant." (Emphasis supplied.)

We submit that our discussion of these different heat transfers (Appellant's Main Br. 25-32) has been wholly ignored in appellee's brief because appellee has no answer to it.

2. Appellee refers (Br.* 13) to "appellant's contention that he went contrary to the prior art thinking by decreasing tube surface (Br. 16)." This is an incomplete statement of appellant's contention. What appellant said on page 16 of his main brief is as follows:

> "Appellant went contrary to the prior art thinking. He decreased tube surface, but taught a specific ratio between the combustion space within the tubes and the surface area of the tubes; also a spe-

---

* Br. refers to appellee's brief.

> cific ratio between the surface area of the tubes and the area of the top of the cooking vessel."

Both the A.G.A. Bulletin (App. 134) and the Kells patent (App. 171, col. 1, lines 32-37; App. 173, col. 6, lines 21-24) show that the prior art was attempting to solve the problem of a higher rate of heat input by increasing tube surface area. The application at bar clearly sets this forth (App. 68, 71). Example IV in the application (App. 70) shows the best performance of the prior art examples and has the largest tube surface. Appellant made a very substantial reduction in the tube surface of his fryer as compared with Example IV. It is thus clear that Keating did depart from the prior art thinking and taught an entirely new concept of volumetric ratio.

3. A fair reading of the A.G.A. Report (App. 119-135) shows that the only solution of the heat input problem advanced as practical by the A.G.A. engineers was to increase the heating surface of the tubes. Appellee (Br. 11-12) lists alleged other solutions, which he claims the A.G.A. Report suggests, but omits the stated deficiencies and limitations of these alleged other solutions which are expressly set out in the Report. The A.G.A. engineers did not consider these alleged other solutions practical or worthwhile as shown below.

(a) Forced circulation of oil.

The Report states (App. 124): "Forced circulation of cooking oil, *if practicable,* * * *" (emphasis added). Since this method is not mentioned elsewhere in the Report, the A.G.A. engineers apparently did not think it a worthwhile or practical solution to the problem. Appellant does not resort to forced circulation of the cooking oil.

(b) Increase of stack height.

In at least three places the A.G.A. Report states that increase of stack height would be objectionable to the industry, or that it was "problematical whether such methods would be acceptable for field use" (App. 123, 130, 132). The Keating structure does not require an increase in stack height.

(c) Use of power burners.

Any special benefits obtained from power burners arise from the type of burner used and not from the design of the fryer itself. The use of special type burners is outside the scope of this application. Appellant sought successfully to improve the rate of heat input by design of the tubes.

(d) "That the most obvious method of increasing heating speed would be to increase the gas input rate (App. 128)" (Appellee's Br. 12).

Appellee says only the foregoing, but the paragraph in the A.G.A. Report from which he borrows the above excerpt states further that in order to increase the gas input rate "it is necessary to add vertical stack to the flue outlet for adequate chimney effect and to increase baffling at the same time * * *" (App. 128). As stated above, the stack height is objectionable and impractical in the field. Even though stated to be the most obvious solution, it was not found to be a workable solution by the A.G.A. engineers due to dangers of poor combustion inherent in the nature of immersion tubes (App. 128; Appellant's Main Br. 30).

Further evidence of the A.G.A. engineers' position is shown by the following excerpt from the *abstract* of the Report (App. 123):

> "Results are included showing the *necessity of increasing heat transfer surface areas materially* if substantial improvement in preheating speeds and thermal efficiencies are to be made with atmospheric type burner equipment and *without* condition of objectionable vertical stack heights." (Emphasis added.)

4. Appellee states (Br. 12):

> "Since the introduction of heat quickly is said to be the crux of the case (Br. 21), it has not been shown that appellant by his construction has produced unusual or superior results over the prior art, particularly when such art is considered in the light of facts known to those skilled in the art."

Appellee ignores the uncontradicted testimony as to the impressive and unexpected results of the Keating fryer. (See Appellant's Main Br. 32-38).

The appellee's contention that there was no comparison of appellant's structure with the Kells and O'Dowd prior art fryers is not consistent with the facts in the record (App. 24-25). Plaintiff's Exhibit 8 is a model of the Kells fryer (App. 24) and the results of tests on the model were stated (App. 25). The witness Keating said that Pl. Ex. 8 was "strikingly similar" to the drawings in the Kells patent (App. 24), and that is true. Exhibit 8 and the Kells patent are in evidence and can be compared by the Court. While Pl. Ex. 8 may not literally follow every detail of cabinet design, etc., as shown in the Kells patent drawing, the physical exhibit is obviously the Kells device. Appellee carefully, but conspicuously, avoids trying to point out any material difference between Pl. Ex. 8 and the Kells patent. Furthermore, some time between 1944 and 1947, a commercial device such as Pl. Ex. 8 had been manufactured and sold by the Wolfe Range Company of Los Angeles, California (App. 24). The manufacturer would obviously make a fryer with the highest rate of heat input of which he was capable. The tests on Pl. Ex. 8 show that it was clearly deficient as compared with appellant's fryer. Appellee complains of the discrepancy between 14 minutes and 10 seconds of preheat time which Keating obtained with Pl. Ex. 8, and the 11 minutes claimed in the Kells patent (Br. 11). No burden rests on appellant to explain this difference. Appellant is not responsible for claims made in the Kells patent, but even on Kells' claim the Keating fryer shows an improvement in performance of 140%. With respect to Pl. Ex. 8, Keating's tests show that his fryer is an improvement of 185% on preheat time.

The prior art O'Dowd patent was owned by the Standard Gas Equipment Corporation (App. 165), which was one of the assisting appliance manufacturers in the A.G.A. Research Project reported in 1944 (App. 121). Clearly Standard Gas contributed nothing to increasing the rate of heat input other than the old worn theory of increased tube surface. (Table 9, App. 133.)

The witnesses Rulon, Daniels and Fineran were familiar with the best production of the commercial manufacturers prior to Keating, and their testimony as to the substantial advance made by Keating stands uncontradicted.

Blanchard v. *Ooms,* 80 U. S. App. D. C. 400, 153 F. 2d 651, cited by the appellee (Br. 11) is not in point here because appellant has made a comparison of his structure with the prior art relied upon by the defendant.

5. Appellee states (Br. 12): "* * * one skilled in the art would have little difficulty increasing the heating rate of a deep fat fryer of the type disclosed by Kells or O'Dowd." Throughout his brief, appellee continuously makes the assertion that what appellant did was "obvious". Appellee conspicuously avoids explaining why, if his assumption is correct, from 1939 when the O'Dowd patent issued until the introduction of appellant's structure, the low heat input problem still plagued the gas deep fat fryer industry despite an active art.

Appellee significantly chooses to ignore the A.G.A. engineers who were specifically investigating means for increasing the rate of heat input (App. 124) and testing various shaped tubes (App. 133). Can it be said that the A.G.A. engineers were not skilled in the art, or that they were not trying to carry out their avowed purpose? This record shows that both propositions are incorrect.

Kells was certainly one skilled in the deep fryer art. He was working on dimensional relationships of the tubes, but he failed to see the answer.

It is submitted that the facts here show that appellant went contrary to prior art thinking, and that the advance which he made meets the standard of invention.

6. Appellee argues that the lower thermostat setting which can be used in appellant's fryer (325° F. to 335° F.) must be disregarded (Br. 15). The lower thermostat setting is an advantage or effect flowing from appellant's high rate of heat input which is clearly and expressly set forth in the application. Appellant has clearly and expressly stated his advantages of faster preheat time and elimination of recovery time (App. 67-73). He is not required to catalog all of the properties, functions and uses of his invention. *Nichols* v. *Minnesota Mining & Manufacturing Co.,* 109 F. 2d 162, 166 (C. A. 4, 1940); *Smith* v. *Prutton,* 127 F. 2d 79, 83 (C. A. 6, 1942); *Sewall* v. *Jones,* 91 U. S. 171, 185-6 (1875).

In *Nichols* v. *Minnesota Mining & Manufacturing Co.*, 109 F. 2d 162 (C. A. 4, 1940, opinion by Judge Parker), the suit was under the prior statute R. S. 4915 for an order upon the Commissioner to issue to plaintiff a patent on the same invention patented to the defendant. In disposing of a similar contention that the inventor had not disclosed all of the advantages and properties of his invention, the Court said (p. 166):

> "Nor is it important that, in his [the inventor's] efforts to produce a glazed surface, he produced not only such a surface, but also a surface with irregularities due to the presence of the partly fused particles in

> the glaze, which made them adhere more securely to asphalt. That his product had values which he did not anticipate or strive for, cannot deprive him of his right to a patent as its inventor. *Radio Corp. of America* v. *Radio Engineering Laboratories,* 293 U. S. 1, 14, 55 S. Ct. 928, 79 L. Ed. 163.''

Abbott v. *Coe,* 71 App. D. C. 195, 109 F. 2d 449, relied upon by appellee (Br. 15) is clearly distinguishable from the case at bar. There, the claims related to case-hardening a cam in a machine for winding yarn. The application was drawn solely on the theory that the case-hardening reduced crumbling of the cam surface. At the trial, the applicant himself in effect admitted that case-hardening to reduce surface crumbling was old. The applicant then argued that he was entitled to a patent on an entirely new theory, namely, an alleged advantage of case-hardening in relation to lubrication. Applicant was attempting to switch the entire theory of his case. If the patent had issued, it would have taught exactly zero as to lubrication. Nothing of the sort exists here. Having stated certain principal advantages of his fryer, appellant is entitled to a consideration of all of the advantages and properties of this structure.

Appeal No. 13,613.

Appellee states: ''In the aggregate, it is submitted that all that appellant has done is to take the old and well known fryer of Pappas' and supplied it with a plurality of optional variations of obvious nature and character, selected from the prior art, the association of which in a unitary structure produces only the aggregate of the individual results.'' (Br. 17).

The appellee's brief fails even to discuss the primary improvement, namely, the continuous chute for the purpose of reducing clogging and the log jam of hardened, sliver-

like food particles. Ignoring the main feature of the invention, appellee attempts to attack it only from the standpoint of minor structural features.

There is no doubt that each element in the Keating combination was known to the art. However, it is clear that the specific arrangement and placement in combination, which he taught, had never been suggested. Keating demonstrated that his specific placement and prescribed relationship of elements produced a new and useful result which had never been previously accomplished.

Conclusion.

It is again submitted that the judgment of the District Court should be reversed, with directions to enter a judgment granting the relief sought in the complaints.

Respectfully submitted,

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